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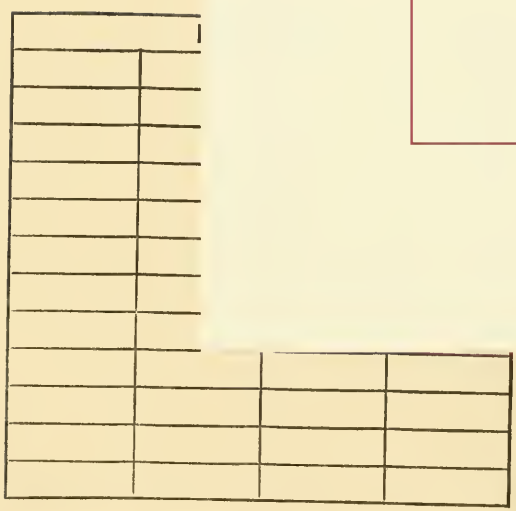

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# TRANSACTIONS

OF THE

# SOCIETY,

INSTITUTED IN THE

STATE OF NEW-YORK,

FOR THE PROMOTION OF

AGRICULTURE, ARTS,

AND

MANUFACTURES.

v. 1

PART I.

Published by Order of the Society.

NEW-YORK:—PRINTED BY CHILDS AND SWAINE.

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John Smith
Eybert A. D. Smith



*AT a Meeting of a reſpectable number of Citizens, at the Senate-Chamber, in the City of New-York, for the purpoſe of inſtituting a Society for the promotion of Agriculture and Manufactures,*

The Honorable EZRA L'HOMMEDIEU, Eſquire, in the Chair.

RESOLVED, That Mr. Chancellor Livingſton, Mr. Simeon De Witt, and Mr. Samuel L. Mitchell, be a committee to prepare and report Rules and Regulations for the government of the Society.

*AT a Meeting of the Society in the Senate-Chamber, on Saturday the 26th day of February,* 1791.

The Honorable JOHN SLOSS HOBART, Eſquire, in the Chair.

THE Rules and Regulations reported by the committee having been read and conſidered by paragraphs, were amended and agreed to, and are in the words following, viz.

RULES *and* REGULATIONS *of the* SOCIETY *for the advancement of* AGRICULTURE, MANUFACTURES *and* ARTS.

I. THE Officers of the Society ſhall conſiſt of a Preſident, Vice-Preſident, two Secretaries, and a Treaſurer.

II. THE Society ſhall meet annually, at the place where the Legiſlature meets, on the Tueſday next after the convening of both Houſes; and continue by adjournments during the ſeſſion of the Legiſlature.

III. The ſtated officers ſhall be elected on the firſt day of each annual meeting of the ſociety.

IV. No perſon ſhall be admitted as a member, unleſs he ſhall have been nominated at leaſt ſeven days previous to his election, and be elected by a majority of the members convened.

V. Every member on his admiſſion, ſhall pay to the treaſurer two dollars; and likewiſe one half of a dollar per annum, during his continuance as a member, to ſupport the funds of the ſociety.

VI. The objects of inveſtigation for the ſociety ſhall be *Agriculture*, *Manufactures* and *Arts*, with ſuch ſubjects of enquiry, as may tend to explain, or elucidate their principles.

VII. The ſociety ſhall parcel the ſtate into diſtricts, and elect at the annual election of officers, a ſecretary for each diſtrict, to reſide within the ſame, whoſe duty it ſhall be to convene the members of his diſtrict, to enquire into the ſtate of agriculture and manufactures within the ſame, to receive communications relative to the objects of the inſtitution, and to correct, arrange, and tranſmit them to the Preſident, to be laid before the ſociety.

VIII. The ſociety ſhall, once in every year, elect a committee, to be called, *The Committee of Publications*, whoſe buſineſs it ſhall be to ſelect ſuch of the tranſactions of the ſociety as may merit publication, prepare them for the preſs, and from time to time publiſh the ſame.

IX. The elections of officers, members, and committees, ſhall be by ballot, and a majority of the members preſent at a meeting, ſhall determine all queſtions.

X. Public notice ſhall be previouſly given, (by the Preſident, or in his abſence, by the next ſucceeding officer) of the chamber, and hour appointed for each annual meeting.

XI. If the preſiding officer or ſecretaries, be abſent from any meeting, the ſociety ſhall elect one to ſerve, pro hac vice.

XII. The funds of the ſociety ſhall be appropriated by the majority of the members preſent at regular meetings, to the objects of the inſtitution, in ſuch a manner as ſhall be deemed moſt beneficial, and to no other purpoſe whatever.

XIII. Honorary members may be admitted in the manner preſcribed for the election of ordinary members, from among perſons not reſiding within this ſtate, whoſe talents and characters may add to the reſpectability and uſefulneſs of the ſociety.

XIV. No perſon elected as an ordinary member ſhall be entitled to the privileges of the ſociety, unleſs he ſhall have ſubſcribed theſe rules and regulations, and paid his arrears, if any are due, to the ſociety.

XV. Donations may be received by the treaſurer, to be added to the funds of the ſociety.

XVI. In order to prevent impoſition, the ſecretaries ſhall reject all doubtful and ſuſpicious facts, and to each article of intelligence tranſmitted to the ſociety, annex the name of the perſon offering it.

XVII. The ſociety ſhall be kept in order, by the rules which are obſerved for that purpoſe, by the Aſſembly of this ſtate.

THE Members preſent then proceeded to ballot for their officers—when the following gentlemen were elected:

THE Honorable ROBERT R. LIVINGSTON, Preſident.

THE Honorable JOHN SLOSS HOBART, Vice-Preſident.

ALEXANDER M'COMB, Eſq. Treaſurer.

JOHN M'KESSON, Eſq. Secretary.

LETTER *of the* AGRICULTURAL SOCIETY *to the* FRIENDS *and* PROMOTERS *of* RURAL ECONOMY.

*(Circular.)*

GENTLEMEN,

DURING the late ſeſſions of the Legiſlature, a number of gentlemen, as well private citizens as members of the two Houſes, aſſociated for the purpoſe of promoting by their united labours the progreſs of Agriculture, Arts and Manufactures in this ſtate. It appeared evident to them, that by directing the attention of all claſſes of people to the obſervance of facts, and by inviting communications to the ſociety from every perſon who had the leiſure and capacity to make them, a valuable collection of knowledge would be obtained if each obſerver would contribute his mite. Nor was it leſs manifeſt, that works of mere ingenuity, eſſays upon ſpeculative and abſtract ſubjects, and performances intended to diſplay literature and erudition, came not within the ſcope of this inſtitution; its humbler, and as they believed, its more uſeful intention, is, to ſupply the wants and relieve the neceſſities of mankind, and thereby to *render human life more comfortable;* to multiply the productions of the land, to ſhorten or facilitate the toils of the labourer, and to excite a ſpirit of honeſt induſtry, whereby *riches may become more abundant;* and by inculcating the importance of ordinary and common things, and of practical every-day truths—to ſtore *their underſtandings with ſolid knowledge;* ſo

that happineſs, wealth and wiſdom, may keep pace with each other, and go hand in hand.

With a view of eſtabliſhing their inſtitution upon a broad baſis, and of conducting their buſineſs upon a liberal plan, the founders have taken into fellowſhip a number of reſpectable characters throughout the ſtate, from whoſe talents and diligence they have much to expect.

In order to make known the objects of the ſociety in a more particular manner, it was judged proper to cauſe certain queries to be printed and publiſhed, that the attention of their correſpondents might thereby be directed to ſuch matters as come within the compaſs of the inſtitution. It is not expected any correſpondent will undertake to anſwer the whole of the queſtions; but it is preſumed that among thoſe which are hereunto annexed, every obſerver may find ſome adapted to his own ſituation and talents. Continually deſirous of procuring all ſorts of knowledge upon the ſubjects for which the aſſociation was formed, the ſociety would not wiſh to reſtrict the enquiries of their members or others to the articles enumerated, but would gladly receive communications upon every other matter included within the limits of their plan.

## QUERIES.

1. Manures. Have you made any experiment upon Marl? Does your neighbourhood furniſh either ſhell-marl or ſtone-marl? Has plaſter of Paris been introduced into uſe? What is its operations? Does it merely cauſe clover to grow,

or is it ſerviceable to other graſſes, and to wheat and Indian corn? Is it as good as dung? Can it be in any caſe ſubſtituted for dung? Is lime very beneficial as a manure? In what quantity, and on what ſoils, and for what plants is lime proper? Is quicklime as good as mild lime? Is not lime-ſtone when ſimply powdered as beneficial as when it is calcined! For what plants is aſhes particularly ſerviceable? Is leached aſhes leſs valuable as a manure than unleached? In what proportion? What is the beſt method of making and collecting manure in a farmer's yard?

2. Soils. Is the ſoil on which your experiments are made ſandy? or clayey? or is it loamy? Is it overſpread with ſtones, or interſperſed with rocks? What is the particular compoſition of it? Is there not a peculiar ſoil, beſt adapted by nature to each particular plant? How far can art proceed in mending nature's work by improving ſoils? What kinds of grain or graſs are found by experience to thrive beſt in any particular ſoil? What ſubſtances do you find in ſoils, unfriendly or hurtful to vegetable life? How can theſe be corrected, overcame or removed?

3. Tillage. To what depth ought land to be ploughed? Should the black mould only be turned up, or ought the yellow ſoil below to be expoſed alſo? By what management in detail, are weeds and graſſes beſt deſtroyed in your fallow land? How is your land beſt made mellow for the reception of ſeed?

4. Stock. Is it good huſbandry to keep many horſes? Are not oxen much more ſerviceable and profitable? What is the comparative expence of a pair of horſes and a yoke of oxen? Have mules been bred by the people of your quarter? Would the breeding of mules be beneficial in this country? Do horſes draw beſt by collars or hames? Are oxen capable of doing moſt work when drawing by the horns or by the withers? How are ſheep beſt managed? What management is beſt adapted to make the wool fine and plentiful? How can the breed be improved? How the mutton made ſweet and ſavoury? Can any thing be gained by ſhearing lambs the firſt year? Might old ſheep be ſheared oftener than once a year? What are their diſorders? How can they be remedied or cured? Have you made any improvement in raiſing neat-cattle? Which is the cheapeſt method of rearing calves? In what manner and at what age is the beſt veal produced? How is the beſt beef made? By what particular management are cattle beſt prepared for the knife? How beſt kept for the pail? Which are the moſt approved methods of making and preſerving butter and cheeſe? What kinds of herbs or plants are unwholeſome or poiſonous to neat cattle? Do you know any facts concerning the venomous qualities of wild cherry-tree leaves? How are cattle beſt relieved when choaked by apples or potatoes, &c.? What is the cauſe of the horn diſtemper? How can it be avoided or removed? Have you any thing new and uſeful about ſwine? Which variety of the breed is moſt profitable? Would it be

advantageous to introduce goats into this ſtate? What is the beſt plan of a poultry yard? Cannot wild ducks and teal, and heath-hens and wild turkies be tamed and domeſticated?

5. GRAIN. Which variety of wheat is moſt productive—the red, white, yellow, bearded or bald? In what proportion does winter wheat excel ſummer wheat? What occaſions wheat to blaſt? What turns it to ſmut? How does mildew happen? Can any or all of theſe be prevented? Can wheat turn to drips? How is wheat beſt preſerved between harveſt and threſhing time? between this laſt and grinding? In what ſoils and ſeaſons does rye flouriſh? What is the proper cultivation of oats? Why are the New-York oats ſo much lighter than the Britiſh or Canadian? Is barley well adapted to our ſoil and climate? Is it worth the while to enter largely into the culture of it? Is any part of our country adapted to the raiſing of rice? Can millet and ſpelts be cultivated with ſucceſs and advantage? What is the moſt approved method of raiſing a good crop of Indian corn? How is the ground beſt prepared for it? How ſhould it be manured? How weeded and tended? Can you give any information as to the raiſing of flax and hemp? How, and in what manner can the greateſt quantity of each be raiſed on an acre? of the fineſt quality? with the moſt ſeed? To what extent, and in what manner can peas and beans be cultivated?

6. GRASSES. What graſſes do you find to afford the beſt paſture? Which make the beſt hay? Have you any facts on the relative produce of ſpear-graſs, clover and timothy? Have

you cultivated ſaint foin, lucern and red-top? What are the reſpective good qualities of each of theſe? Cannot ſome of our indigenous graſſes be greatly improved by culture? Might not ſome exotics be imported from Europe? Which ſort of paſture agrees beſt with ſheep? neat-cattle? horſes? ſwine? What practical directions can you give on the ſubject of grazing?

7. Fruit-Trees. What kinds of apples afford the beſt cyder? All facts reſpecting the graſting, inoculating, and planting of orchards will be acceptable. To what extent ought pear trees to be cultivated for the ſake of the fruit and the liquor to be obtained from it? The beſt method of cultivating peach, plum, apricot, nectarine and cherry trees, will be uſeful information.

8. Forest Trees. Do you know any facts concerning the propagation of the locuſt-tree? What can be done towards introducing the white mulberry tree? In parts of the country where wood grows ſcarce, would it be proper and profitable to raiſe in nurſeries, and tranſplant hickory, cheſnut, beech, aſh and other trees for fencing-ſtuff and fuel? Or would it be adviſable to make hedges of white thorn, prim, holly, yew, or other ſhrubs? And cultivate peat and turf for making fires?

9. Vermin. How are moles to be guarded againſt? Will the palma chriſti drive them away? Is there any way of deſtroying grubs in your corn and flax? How can the bugs be deſtroyed which eat up your cucumber, melon and pumpkin vines? Is there any way of preventing the ravages of the wheat

inſect? Is this a new ſpecies of animal? Is it peculiar to the United States? Or whence came it? What is the eaſieſt way of deſtroying canker-worms and catterpillars in orchards? Do you know how the lice or flies that infeſt cabbages and turnips can be overcome?

10. Have you any improvements in the management of bees? Can the ſilk-worm be profitably introduced into your neighbourhood? Are there not ſome American phalœnas which might afford good ſilk? What are they? And on what plants do they feed?

11. Manufactures. What is the beſt method of making ſoal leather? Are there any other barks than oak, hemlock and birch fit for tanning? Do you know the method of ſplitting hides for book-binding, parchment, &c.? Have any improvements been made in the manufacture of ſteel? Do you know of any new material for the making of paper? Which is the moſt advantageous way of making pot-aſh? Are there not ſome ochres, the produce of our country, proper for paints? What progreſs has been made in procuring oil from lint, palma chriſti, and ſun flower ſeeds? Can you ſuggeſt any thing capable of raiſing the reputation of our flour in foreign markets? Do you know of any beds of nitre, allum, vitriol, or ſea-ſalt? Are there any coal-mines? Can you ſuggeſt any plan of improving our wool ſo as to render it more fit for ſuperfine fabrics? What can be done toward the manufacture of cotton? Where are we to find, and how collect and work up the materials of glaſs, china and earthen-ware?

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# ORATION,

DELIVERED BY

DOCTOR *S. L. MITCHELL*,

BEFORE THE

AGRICULTURAL SOCIETY OF NEW-YORK,

ON THE 10th of JANUARY, 1792.

---

MR. PRESIDENT,

*and Gentlemen of the Agricultural Society,*

SINCE you firſt did me the honor of appointing me to deliver you an Oration, I have been ſeveral times ready to relinquiſh the undertaking, thro' an apprehenſion that I ſhould fail to do tolerable juſtice to the ſubject, and ſhould tire your patience without even amuſing your imaginations. For I know that on occaſions like this, more ingenuity and ſprightlineſs of thought, and more of the poliſh and ornament of diction are expected to embelliſh the phraſes and ſentences of the Speaker, than on common occaſions; and therefore felt, as I judged, a well-grounded fearfulneſs, leſt ſomewhat of bluntneſs in ſentiment, and plainneſs in expreſſion, might ſound rather harſh or uncouth to the nice ears of my audience. Bear with me then, while I expreſs my meaning in my own way, without declaiming in the

elegant copiouſneſs of *Pliny*, or the ſubtil erudition of *Eraſmus*. Withdraw your minds a little while from public cares, and by way of relaxation from the greater concerns of politics, juriſprudence and legiſlation, ſuffer them to be conducted by me to the contemplation of Agriculture and rural affairs.

FORTUNATELY it happens, that no violent effort is neceſſary, either on your part or on mine, to fix and confine attention to the theme, ſince there is a natural propenſity in the human mind to be pleaſed with the ſcenery and proſpects of the country. When all the pomp and luxuries of high life have palled upon the ſenſes, then the jaded minds of the cits are refreſhed by ideas of breezes and trees, of vallies and brooks, of ſhepherds and their flocks. Thus in the palace of *Ptolemy* could *Theocritus* charm the courtiers with his rural lays, ſo did the *ſwain of Mantua* delight the minions of *Auguſtus* with the dialogues of *Melibœus* and *Tityrus*, of *Menalcas* and *Palemon*. In like manner, in later days, have *Geſſner* and *Haller* pleaſed the taſte of the Germans with their paſtoral eſſays, as much as *Pope* and *Phillips* have gratified that of the Engliſh. The imagination loves to range without controul in this romantic variety of productions; and according to the humour and inclination of the deſcriber, a country retreat becomes an *Elyſium* or a *Bœtica*, an *Arcadia* or a *Paradiſe*.

IT would be unneceſſary to cite from doubtful antiquity, the ſtory of the goddeſs *Ceres*, who is ſaid to have travelled over the world with her Cornucopiæ, to preſent bread-corn to

mankind, and inſtruct them in the art of cultivating it; and it would be equally uſeleſs to quote from the ſame fabulous authorities, any particular accounts of the divinities, *Priapus*, *Flora* and *Pomona*, who were thought to preſide over gardens, flowers and orchards. The rays of right reaſon have diſſipated the darkneſs of theſe ſuperſtitions, and ſhewn us that next to the providential bleſſings of a good ſeaſon, the huſbandman, truſting to the laws of his country for ſecurity, depends, under their joint influence, upon his own labour, induſtry and vigilance for the various and plentiful produce of the year.

For among the numberleſs favours which Divine bounty has beſtowed upon this fortunate land, that which in the firſt place claims our grateful acknowledgments, is the abundant harveſt which rewards the induſtry of the farmer: ſince to a healthy climate and a fruitful ſoil, there is annually added the genial influence of a ſeaſon, that beautifies ſpring with bloſſoms, and loads autumn with fruit.

But neither the fertility of the land, nor the wholeſomeneſs of the ſituation, nor the favorableneſs of the weather, would properly encourage agricultural exertions if the temper of our laws did not ſecond the attempts of the labourer, by encouraging the *ſickle* and honoring the *plough*.

By the wiſe policy of our Legiſlature, the ſhackles of feudal bondage have been knocked off, and our citizens, who feel nothing of vaſſalage or ſervitude, act with the ſpirit of Freemen. The abrogation of the laws of entails and of primogeniture

has had the moſt happy effect in rendering eaſy the diviſion and alienation of real property, whereby the natural right of every man to a certain part of the earth's ſurface, which in former times had been violently and unjuſtly wreſted from the greateſt part of thoſe who had advanced much above barbaric rudeneſs, is reſtored, and with it that mediocrity of condition which hears with honeſt indignation the "monſtrous faith of *many* made for *one*." The allodial and ſocage tenures of our lands, by giving free ſcope to purchaſers, and undivided profit to cultivators, have paved the way to more virtue and happineſs than all the mines of Peru and Mexico ever have afforded.

And even with all theſe advantages, how deſolate, how proſtrate is a country until improved by the hand of induſtry! Turn your eyes to the United States and behold its achievements:—Three centuries are ſcarcely paſt ſince theſe regions were diſcovered, till then unknown to the more civilized part of the world. Some tribes of Savages were here and there ſcattered over the country, whoſe ſubſiſtence was principally derived from the chace. Their chief dependence was on the precarious product of fiſhing and hunting. Their agriculture did not conſiſt of much more than the cultivation of a little pulſe and maize. As the wild animals upon which they fed multiply infinitely more ſlow than tame ones, it neceſſarily followed, that in ſuch a ſtate of ſociety, a very large tract of country was neceſſary for the maintenance of a very few inhabitants. Rude men and wild beaſts roamed in ſcanty number thro' the pathleſs wilderneſs, and poſſeſſed a wider

range of commonage than according to juſt diſtribution they were entitled to. At that time murmuring and diſcontent aroſe in the hives of Europe, and ſwarms of emigrants flew weſtward and colonized along theſe coaſts. The new-comers claimed, under *nature's univerſal charter*, a part of that land which the natives poſſeſſed excluſively in too great a proportion. Their ſettlements grew, their population increaſed, and oh! that any acts of cruelty and oppreſſion have been committed to tarniſh the ſplendour of their works. Ancient oaks and pines fell beneath the ſtrokes of the axe, ravenous wolves and tigers forſook their abodes, and in the midſt of a deſert waſte and wild, the hardy adventurers ſcooped out a dwelling-place. Where lately briars and nettles deformed the ſpot, the conſuming operation of fire prepared the earth for the reception of wheat and rice. Tobacco and indigo, laying aſide their wildneſs, put on a domeſticated look. Orchards of apples, pears and peaches ſprung up where not long ſince the toxicodendron emitted its poiſonous vapours. The horſe, the cow, the ſwine and the ſheep ſucceeded the deſtructive beaſts of the foreſt; and where the ſavage hornet formerly took his dreary flights, the honey-bee, over meadows of blooming clover, collects her ſweets: I ſee the ſettlers in their progreſs from the Atlantic coaſts collect the peltry and lumber of the woods into vaſt magazines; I ſee them hew out roads, drain ſwamps, build bridges and conſtruct mills; I ſee them climb up the ſide of the Apalachian mountain, and paſſing that formidable ridge, eſtabliſh themſelves on both ſides of the Ohio; I ſee the wilder-

neſs every where as they go, changing to a civilized country, and ſmiling with plenty, even beyond the Miſſiſippi. Such are the enterprizing labours of thy citizens oh! America.

*Salve magna parens frugum!*
*Magna virtum.*———

Such are the wonder-working effects of induſtry, altho' its operations were cramped in the beginning by the ſelfiſh policy of Britain, and afterwards interrupted by the unnatural war which for ſeven long years ſhe waged with the people of this land. Even then, while green in the griſtle of youth, and not yet hardened in the bone of manhood, Columbia's ſons, as induſtrious in defending as in aſſerting their rights, told the tyrants "they wiſhed to be free," and as the mild language of petition and remonſtrance was treated by him with contempt and diſdain, they in a voice that ſtruck with terror and diſmay both himſelf and his hoſt, replied to him as an *argumentum crucis*, the ultima ratio of nations, and from the cannon's mouth thundered the unwelcome truth in his ears.

Hitherto, the American huſbandman has cultivated a ſoil, enriched for ages by the yearly addition of a freſh ſtratum of mould. From the firſt exiſtence of vegetation upon the dry land, decayed plants have continually furniſhed a ſupply of manure, which the winds and rain have liberally ſpread abroad. As the ſupply was annually greater than the conſumption, the earth, unexhauſted by it productions, increaſed in fertility. The thick layer of vegetable mould which covered the face

of the earth was a ſtore-houſe of food for plants, and this quantity was greatly increaſed by the converſion of wood into aſhes by clearing. It is not wonderful then, that for ſome years newly-cleared ſettlements ſhould abound in produce, and require little more labour than that of ploughing and reaping; for during this period the proviſion is waſting, which for centuries had been accumulating. But the time will come, and indeed in many places now is, when the land, repeatedly wounded by the plough-ſhare, and exhauſted of its richneſs, ſhall be too weak, of itſelf, to make plants grow with their former luxuriance. This may be called the æra of ſyſtematic agriculture, when man, taking the earth from nature's hand, bare of manure, is ſo to manage and diſpoſe it artificially, that it ſhall yield him firſt a ſubſiſtence, and then an overplus to grow wealthy upon. How far art may go in this ſpecies of improvement is yet unknown, as the *ultimatum of fertility* has never yet been reached. As far as experiments have been made, we find the earth liberally affording its produce, in proportion to the labour and ſkill beſtowed in its tillage; and as the ingenuity and invention of man may increaſe to an unknown and inconſiderable degree, ſo may the improvements and arrangements of huſbandry keep pace therewith, until the moſt fruitful ſpot that now exiſts, may produce a tenfold quantity, and the land which now ſupports an hundred men, give equal enjoyment to a thouſand. Recollect, for inſtance, what agriculture has done in two countries, naturally very unfavourable to it, Switzerland and Scotland; compare their

preſent populouſneſs and happineſs, with what they formerly were in Cæſar's time; calculate whether theſe countries are not, by the well-applied induſtry of their inhabitants, as different from ancient *Helvetia* and *Caledonia*, as *Ireland* is ſuperior to *Labrador*, or *New-York* to *Terra del Fuego*.

Columella relates a ſtory finely illuſtrative of the excellence of good tillage:——De re Ruſtic. L. iv. c. 3.—"Græ-" cinus in his book concerning vines, relates that he had often " heard his father tell of a certain Paridius who had two daughters, " and a farm planted with vines. Of this farm he gave one third " part, as a marriage portion, to the man who wedded his elder " daughter, and notwithſtanding, received as much produce as " before, from the two thirds which he reſerved to himſelf. " Afterwards on the marriage of the younger daughter, he gave " away the half of the remaining land, and found his income ſtill " in no reſpect diminiſhed. What concludes he from this? " But that the *third part* of the farm was at length better culti-" vated than *the whole* uſed to be before."

But in this ſtage of farming, a well managed plantation muſt be carried on with ſteadier labour and more exact ſkill than in the former. For now when timber becomes ſcarce, fences are more difficult to be kept in repair; where the ground is not of itſelf productive enough, manure muſt be procured; if a farmer's own ſtrength is not ſufficient to carry on his buſineſs, a number of additional labourers are now neceſſary. In order to perform this requiſite labour, two ſorts of workers have been employed, hired free-men and ſlaves. Upon calculations and eſtimates

fairly made, it appears that the profits of plantations muſt be enormous to ſupport the expence of a ſlave-cultivation. The income of a rice, an indigo, a ſugar or a tobacco eſtate has been great enough in the newly-cultivated lands of ſome of the ſouthern States and Weſt-India Iſlands, to admit of this mode of management. But at preſent the profits ſeem not ſo prodigious as they have heretofore been. The dearneſs of Weſt-India ſugars, the prohibition of new importations of ſlaves in ſome places, and the introduction of the plough in the ſtead of the hoe, all indicate the decline of ſlavery, and all prove it to be leſs and leſs the true intereſt of the planters to conduct their buſineſs in the old way. Where the produce of a farm is bread-corn, flax, hemp, graſs and live ſtock, the profits are moderate, and the labour of free-men is generally preferred, as moſt conſiſtent with good œconomy: accordingly, in the northern States, ſlavery is entirely aboliſhed. It appears from the great depreciation and frequent manumiſſions of ſlaves in this State, that our fellow-citizens are becoming convinced of the ſame truth by experience. Upon taking a ſurvey of the ſlave-holders with whom I am acquainted, I find thoſe who have the greateſt numbers, to be men of conſiderable hereditary eſtates in land, or of a handſome capital acquired by marriage or bequeſt, but I cannot name an inſtance of a man of ſmall property, ever getting rich upon the profits of ſlave-labour. Therefore the kitchen eſtabliſhments of thoſe who keep fifteen or twenty negroes are not to be conſidered as matters of revenue but of expence, juſt after the manner of a ſtud of ſupernumerary

horſes, kept either to indulge the pride or gratify the prejudice of their owner. It is to a conviction of the impolicy and expenſiveneſs of this kind of ſervice, rather than to any moral or religious conſiderations on the ſubject, that the decline of ſlavery is principally to be attributed.

But I would not wiſh to be underſtood that the whole of our labour ſhould be applied to agricultural purſuits, as if thoſe were, as ſome argue, the only induſtry that is productive; for I think it may be clearly proved, that the capital and labour of this country, will be moſt advantageouſly employed, if a part of it is expended in manufactures; the beſt policy in this reſpect, being to carry on agriculture without neglecting manufactures, and at the ſame time ſo to manage manufactures, as that agriculture may be conducted with a due degree of ſpirit. That accumulation of monied capital which is ſo rapidly making in the United States, beyond the amount neceſſary to carry on the agricultural and commercial buſineſs thereof, is a moſt favorable prelude to the eſtabliſhment of domeſtic manufactures, to which the preſent ſpirit of ſpeculation and enterprize of our citizens, ſeems peculiarly favorable.

But how are fields to be artificially fertilized? By manure. This is the great hinge upon which the whole ſyſtem of agriculture turns. In procuring this needful ſubſtance, we are firſt to imitate nature in collecting all the vegetable matter we can find, ſuffering nothing to be loſt. As, however, if a field, yielding graſs for brutes or grain for man is principally exhauſted

of its produce by the creatures whom it ſupports, a very inconſiderable quantity remains for manure. What then is to be done? muſt the land go on to be impoveriſhed from year to year? No. The animal, the vegetable and the mineral kingdom muſt be ranſacked for ſomething to aid the growth of plants. The aſhes of wood and of peat, the muddy depoſitions of puddles and ponds, the unreſpirable portion of our atmoſphere, and ſome of the particles floating therein; the various earthly productions of marle, chalk, gypſum, clay and lime, and likewiſe the excrementitious matters of moſt animals, are found by experience, when properly employed, to promote directly or indirectly the proceſs of vegetation. When theſe things are added to the ſoil, they act in one of theſe ways, 1ſt. They are a pabulum plantarum, and materially contribute to the nutriment of plants, or 2dly, They are ſtimuli to plants, and by exciting them to action, cauſe a greater abſorption of food, a better aſſimilation of it, and conſequently a more rapid and vigorous growth; or 3dly, They ſo alter and diſpoſe the earth in which plants are rooted, that the radicles ſhoot more eaſily and more extenſively thro' it, or in other words, it becomes a better filter for ſtraining and applying nouriſhment to their inhaling or abſorbing veſſels. Here, however, it is neceſſary for me to pauſe; for in order to decide in which of theſe ways manure operates, it would be neceſſary to take into conſideration a much greater aſſemblage of facts than the limits of this attempt permit; and as the ſolution of theſe queſtions involves the intricate diſcuſſion of what the food of plants is, whether water,

inflammable air, phlogiſton or attenuated earth, it ſeems rather too important for diſcuſſion in this conciſe eſſay.

Quicklime has been recommended as a manure, which by corroding, diſſolving and deſtroying the vegetable matter lying about the land, on which it is ſpread, would by its ſeptic quality add to the fertility of the ſoil. It is doubtful whether quicklime, as ſuch, ever does any good; certainly it has done hurt. But let its primary operation be as it may, it ſoon returns to the condition of inert earth by combining in its expoſed ſtate with ærial acid. Lime then is to be conſidered in manuring, merely as calcareous earth in powder, and not as having undergone in the kiln, any change, ſave pulverization. The alteration made in the ſoil by its application is ſimply in the addition of a new ſubſtance to its former ingredients, which may change the filtrating power of the earth, but not apply a freſh ſtimulus to the growing plants. Calcareous earth of any kind, reduced to powder in any way, if of equal purity and fineneſs, ſeems equally adapted to the purpoſes of manuring.

The plaſter of Paris, which has been ſo much extolled by the Pennſylvanians, fails egregiouſly in our trials upon Long-Iſland. There is ſomething ſingular in its failure to do good almoſt every where in the maritime parts of this State. It falls ſhort of the character given to it in almoſt every reſpect. This, I believe, is partly owing to the deception of the buyers, in purchaſing both *marle* and *gypſum*, in a powdery form, under the name of plaſter of Paris. In ſome meaſure alſo it is to be

aſcribed to the hyperbolical praiſes uſually beſtowed upon new diſcoveries and projects. From my own experiments, I have little to ſay in its favor. Once, indeed, it did ſeem to make the clover of my meadow a little more thrifty; but the next year, the very ſpot ſo manured with the plaſter, yielded no better Indian corn than any thereabouts, tho' naturally not more barren.

ALONG the ſea ſhores on the banks of rivers, where *fiſh* are plentiful, they afford a valuable manure. Some ſorts of theſe, which are but indifferent food, may be advantageouſly uſed to increaſe the fertility of land. They aid vegetation by ſtimulating the roots of plants. It is not eaſy to ſay how extenſively farms conveniently ſituated may be improved, by a proper uſe of the innumerable ſhoals of theſe creatures which in great variety viſit our coaſts.

WHEAT, which is one of our ſtaple articles, ought to receive a primary degree of attention. Great complaints are made in foreign places of the foul condition of the grain, and the bad quality of the flour which we export. In as much as we value the goodneſs of our commodities and our credit as a commercial people, we ought immediately to ſtop the growth, yea, hinder the continuance of this evil. The Chamber of Commerce of New-York, ſome time ago publiſhed ſome ſeaſonable and judicious remarks on the purification of wheat offered for ſale. Cockle, drips and ſorrel often mingle their ſeeds with the crop, and by the careleſſneſs of the farmer, the

mixture of them all is brought to market for wheat. This adulteration, tho' it lowers the price, is however pretty well corrected by the rolling-ſcreen. But the worſt vitiation that befalls the wheat-harveſt is the commixture of *rye*. No machine has yet been found capable of effectually ſeparating them, and from the nearneſs of ſize in the two ſorts of grain, it is not likely that ſuch an one can be contrived. The method of remedying this inconvenience radically, is to remove all traſh from the fallow-field, to ſow nothing but the pure ſeed you wiſh to grow, and if, after theſe two precautions, any foulneſs ſhould appear, to tear up or cut off the intruding plants. Thus by a little additional care of the farmer, may purity be reſtored to our harveſts, and reputation to our markets.

The ſugar of the maple-tree has become an article of ſome conſiderable importance. It is probable, for ſeveral reaſons, its growing will encreaſe. Firſtly, The new lands of the Weſt-Indian cane-iſlands are wearing out, and as the ſlave-cultivation, which is the moſt expenſive of any, ſtill continues there, the product and profit of the plantations muſt certainly diminiſh. Secondly, The demand for ſugar is greater than ever, on account of the encreaſing population of ſeveral countries which conſume it, as the United States and Canada, for example. Thirdly, Among people who have been for a long time conſumers of ſugar, faſhion and habit have rendered them more extravagant in the uſe of it. Fourthly, The duty impoſed upon foreign ſugar by the act of Congreſs adds to its dearneſs.

As therefore there can be little expectation of the cheapening of foreign ſugar, but rather when we conſider the inſurrections and diſorders in ſome of the principal iſlands, we ſhould apprehend the price may ſtill go on to riſe, there is a well-grounded conjecture that our domeſtic ſugar manufacture may be highly beneficial to the State; eſpecially ſince it cannot only be granulated in the moſt beautiful brown form, but can be refined and whitened into loaves of the firſt quality. How far it might be poſſible or proper to carry into effect the project of planting orchards of maple-trees, may be well worth the Society's attention.

The locuſt-tree (Robinia Pſeudacacia) is one of the moſt valuable trees now cultivated. They grow beſt in warm ſandy land, and become fit for timber in about twenty-five or thirty years. They do not grow bulky enough for ſawing into boards, or hewing into beams for large buildings; but their greateſt uſe is for ſhip-trunnels, fence-poſts, mill-cogs and fire-wood. A well-grown tree is worth to the proprietor as it ſtands, four dollars; this when cut, ſawed and ſplit, can be made into one thouſand trunnels, which may be ſold for ſeven dollars and a half in a ſhip-carpenter's yard. Or if mill-cogs be formed of it, they endure long friction before they wear out. Or if worked into poſts to be ſet into the ground for garden-fences and other handſome incloſures, they are ſuperior in point of durability to almoſt any known wood; for ſome which have been examined after twenty years expoſure to the weather, without paint,

appeared to be as little impaired as if they had been recently planted, and it is ſaid they will laſt in a ſound and good condition fifty or ſixty years, and even longer: and for theſe ſeveral purpoſes they equal or excel mulberry. If uſed for fuel, it makes a fire as hot, briſk and comfortable as hickory. The locuſt is ornamental as a flowering tree, as well as uſeful for timber. The bloſſoms which are of the papalionaceous kind, unfold in the end of May, or the beginning of June, and hang down in beautiful white cluſters to the number of twenty or thirty ſingle ones upon a foot ſtalk, perfuming the air to a conſiderable diſtance with their ſweet and fragrant odour. It is ſo eaſily cultivated, that on Long-Iſland one often ſees large pieces of land entirely overgrown with artificial woods of theſe trees. As our commerce and manufactures improve, the demand for this valuable timber will encreaſe, and more eſpecially on account of the approaching ſcarcity of wood in the neighbourhood of the capital of the State. Therefore it ſhould be recommended to all farmers on whoſe lands locuſt-trees will grow, to begin immediately the cultivation of them, as well for the profit as the ornament to be thence derived; and they may be aſſured that in a ſuitable ſoil and climate, ſucceſs will attend their endeavours, ſince no extraordinary ſkill nor expence is required in the management of them.

Some attempts have been made to propagate the vine among us, by gentlemen who ſeemed anxious for its general introduction and culture. They have procured from ſome of the ſouthern countries of Europe cuttings of the moſt choice vines,

hoping that after growing in our climate, they would retain the flavor peculiar to the grapes in their former ſoil. I do not know that much ſucceſs has followed theſe attempts, except in ſmall experiments in gardens and on fruit-walls. I am doubtful what to ſay concerning the eſtabliſhment of vineyards among us. I fear the weather is too variable, and the winters too cold to allow the ſouthern vines to thrive. Yet, in tracing the vine from Aſia, where it firſt grew, we find it planted in ſucceſſion on the iſlands of the Archipelago and the ſhores of the Mediterranean Sea, until the time of the Emperor Probus, who permitted the planting of it in Ciſalpine Gaul, where it had been forbidden before by Domitian and his predeceſſors, whence it was carried north of the Alps to regions formerly believed to be too unhoſpitable for its growth. It has ſince by degrees become naturalized to the countries where it now lives. It is true that ſeveral learned men have entertained an idea that the climates of France and Germany have become more mild than anciently they were, and there are many well authenticated facts in hiſtory to corroborate the opinion. Still, ſomething perhaps may be done by domeſticating our indigenous vines, of which there are ſeveral ſorts, and meliorating them by kind cultivation; or if European ſhoots muſt be ſent for, they ſhould be brought from the northern provinces of France, or the weſtern dominions of Germany, whoſe climates more nearly reſemble our own.

The white-mulberry tree is already growing in our State, and is ſaid to be cultivated to conſiderable extent in Con-

nefticut. The Legiſlature of New-York, during the laſt ſeſſions, were liberal enough to offer a reward to the ſucceſsful propagator of them. There is therefore little need of expatiating on a ſubject already recommended by its own utility, and by legiſlative ſanction. I ſhall only remark, the trees are afforded to purchaſers at ſo low a price, and the ſilk-worms can be fed and attended at ſo little expence, that there ſeems ſufficient inducement to undertake the buſineſs, even without the incentive of the bounty.

The mangel-wurtzel, or root of ſcarcity, ſeems not to have ſucceeded among us in a degree equal to the character given of it by the French and Engliſh writers. It is therefore doubtful whether we ſhall ever be much benefitted by the introduction of this plant. It is to be wiſhed, however, that a plant of which ſo much has been favorably ſaid, may not be abandoned without full and convincing experiments of its inutility in American huſbandry.

Much greater profit may be expected from the potatoe, which ſeems better adapted to our climate, and has been greatly improved within thirty years. It ought to be particularly attended to in planting them, that the cuttings be made from thoſe of the largeſt ſize, or rather that whole ones, without any diviſion whatever, be planted to raiſe a crop from. I mention this the more particularly, becauſe it is too common a cuſtom to allot the largeſt roots to the kitchen, and reſerve the ſmaller ones for the field. It is ſurpriſing what difference

there is between the ſize, vigour and produce of little potatoes and big ones, planted in the ſame ſoil and tended with equal care. I am convinced that by the injudicious planting of the ſmaller ones laſt ſeaſon, my potatoes did not yield me half ſo many buſhels as they would have done, had very great ones been committed to the earth in their ſtead. Some experiments made not long ago in England and Nova-Scotia, ſet the difference in favor of large ones in a ſtrong light.

It cannot have eſcaped your obſervation, gentlemen, how backward we are in raiſing of barley. The extenſive and numerous breweries of New-York and other parts of the State, are but partially furniſhed with the material of malting from our own produce. It is undoubtedly a ſubject of ſerious regret, that while our farmers exhauſt the ſtrength of their fields by impoveriſhing crops of oats, they neglect the more profitable culture of barley, and thereby neceſſitate the brewers to import their grain from the neighbouring States or from foreign parts, or drive our citizens to the leſs wholeſome and more expenſive uſe of diſtilled ſpirits. The practice of raiſing barley is to be conſidered more lucrative to the farmer, as being a better employment of his labour and capital, and likewiſe more advantageous to the State by preſerving the morals and induſtry of its people from the injurious effects of rum and other ardent liquors.

Nearly connected with this is the raiſing of Hops. The emolument derived from hop-yards to the owners of Kentiſh eſtates, may ſerve as encouragement to the American huſband-

man. This plant grows ſpontaneouſly in our ſtate, and undoubtedly could be highly improved by care and management. That proper attention ſhould be paid to it is to be wiſhed, not merely for the ſake of its flowers as an ingredient in brewing, but that proper experiments ſhould be made on its rind, to know whether it might not be prepared in a form ſuitable for cordage or ſome ſuch manufacture. Much remains yet to be done in finding out and preparing the fibrous parts of plants.

This leads to the conſideration of Hemp, of which large quantities are imported. It is certainly a pity, in a country like ours, the cultivation of this uſeful plant is ſo much neglected.

Some obſervations remain to be made on ſeveral animals, both uſeful and noxious to farmers. Tho' all remarks on the breed of dogs and horſes may be conveniently ſpared, ſince pains enough is already taken among us to rear them in all their varieties, except that as to the farmer, ſince conſiderable ſlaughter of ſheep is made by them from time to time, ſome better mode of training them for buſineſs ought to be practiſed.

The Bos Bubalis, or tamed Buffaloe of Europe, ought to be introduced as a uſeful beaſt for the draught. He has been long domeſticated in Hungary and Tranſylvania, and has been lately carried into the South of France. His paſſage to the United States might be readily effected, in one of the ſhips trading to the Mediterranean. His ſtrength is ſaid to be great, his temper docile, his ſtature large; the hide thick, meat good, and milk ſavoury.

PERHAPS a conſiderable ſaving might be made in the annual expence of a farm, by the ſubſtitution of mules inſtead of horſes. Theſe creatures live upon leſs and coarſer food than horſes, bear more drudgery and hardſhip, and live to a greater age. What but an ignorance of the laborious ſervice they are capable of undergoing, hinders the breeding of them?

THE rejection of the labour of oxen, and the employment of that voracious and expenſive animal the horſe, is in too many places, a matter of ſerious regret. To carry on the work of a great plantation by horſe-labour, without the aſſiſtance of oxen, is perhaps one of the worſt pieces of American huſbandry. Yet how frequently may we ſee large farms managed in no other way!

BEES ought to be more commonly raiſed than we find them. At a ſmall expence they may be increaſed to any number. And what is particularly worthy of notice in their hiſtory is this, that all the product of their induſtry is clear gain, ſince the wax and honey are extracted from flowers, without any damage or loſs to the land or its proprietor, and if not thus ſaved, would irrecoverably periſh. It is alſo true, that cultivated lands, abounding with clover and buckwheat, afford food for very great numbers of them. Therefore, that ſtate of agriculture which is beſt adapted to our convenience and comfort, is at the ſame time moſt ſuitable to the multiplication of theſe inſects. On account of the dearneſs of ſugar, it muſt be very advantageous to raiſe bees, becauſe honey in many parts of domeſtic œconomy, is an excellent ſubſtitute for the product of

the cane. It ſeems to me, as bees can be increaſed in number as far as food will admit, and as honey can be uſed in ſo many caſes inſtead of ſugar, that by due attention to this object, ſo much of this wholeſome ſweetening may be provided, as to leſſen in a large proportion, the importation of foreign ſugar.

Too much pains cannot be taken to improve the breed of our ſheep, particularly as far as reſpects their wool. This great article of clothing, ſo ſedulouſly watched by the Engliſh and Spaniards, has been too much neglected by our citizens. I know of no phyſical reaſon why the American ſheep ſhould not yield fleeces as large and fine as thoſe of Europe. Our manufactures of broad cloth and other woollen goods will require an increaſing ſupply of this material, and will ſoon, I truſt, furniſh ſuch excellent kinds, that our beaux ſhall take a pride to array themſelves in homeſpun. In point of ſalubrity, I am bold to ſay that wool far exceeds linen or cotton, and in our variable climate is ſo peculiarly calculated to guard the body againſt the viciſſitudes of the weather, that every valetudinarian ſhould wear flannel to regain his health; each well perſon to preſerve it. A flannel ſhirt may be called the palladium of health. The ſuperior neatneſs of linen in our dreſs, is but poorly compenſated by the unwholeſomeneſs of it.

Concerning the *wheat-inſect*, I am happy to obſerve that it ſeems to be rather on the decline. Yet ſome fields of wheat were much injured by it before winter ſat in. It is not improbable, that like other plagues of a ſimilar nature, it has its period,

and perhaps the time of its viſitation may be now nearly paſt. Some months ago, I forwarded ſpecimens of it to ſome European naturaliſts, with a view to find out whether it had ever been known in that quarter of the world; ſince which I have been aſſured by Sir *Joſeph Banks*, Preſident of the Royal Society of London, that it does not exiſt in England, and that he has no reaſon to believe its exiſtence in any part of Germany. That gentleman, whoſe zeal and ſucceſs in enlarging the bounds of human knowledge none of you are ſtrangers to, with a generous deſire of affording every aſſiſtance in his power to overcome this deſtructive animal, ſent me the learned and ſplendid Italian work of Count *Ginanni* of Ravenna, upon the diſeaſes to which wheat is ſubject in its growing ſtate. (Delle malattie del grano in Erba in Peſaro 1759. 4to.) In the ninth chapter of the ſecond part of this work, the inſects deſtructive to the Italian wheat, are particularly deſcribed and enumerated to the number of fifty different ſpecies and more; but upon diligently examining the characters and plates, there given of them, I cannot find the American wheat-inſect noted. It is probable, therefore, this fly is not an inhabitant of the South of Europe, or it would not have eſcaped *Ginanni's* accurate ſearch. Tho' perhaps the inſect mentioned, but not accurately deſcribed by Mr. *Chateauvieux*, may be the one now alluded to. Of this, however, his brief account of it, and the want of an engraving, do not permit me to be poſitive. As long as it continues to diſtreſs us, we can only counteract its attacks by richly manuring our fields, and late-ſowing our ſeed. We are almoſt

entirely in the dark reſpecting the hiſtory of the inſects injurious to our uſeful plants, and that man would be laudably and beneficially employed, who ſhould collect what is knowable concerning the different moths, bugs, flies and worms, which infeſt our fields and gardens. A work of this kind, executed after the manner of *Ginanni's*, or upon the plan of *Reaumur's*, would be a capital addition to our Georgical fund of knowledge.

If the Chamois-goat of the Alps was turned out upon the Alleghany mountains, it is very likely he would thrive and multiply there.

Heath-hens, teal and black-ducks, might probably be eaſily tamed, if attempts were judiciouſly made; and the acquiſition of theſe fowls would add richly to our ſtock of domeſtic poultry.

But I forbear to dilate on any more of theſe particulars. My hearers have the numerous volumes written within a few years, on œconomical ſubjects, in the different modern tongues, diſplayed before them; or if their claſſical taſte ſhould lead them to turn over the pages of the Latin authors, whoſe works are extant, *Columella* and *Cawley* will afford them abundant pleaſure, while the *Georgica of Virgil*, and the *Prædium Ruſticum of Vanier*, ſhall convey the moſt ſolid inſtruction to their minds.

# EXPERIMENTS AND OBSERVATIONS

ON

# *Calcarious and Gypsious Earths,*

BY

MR. CHANCELLOR *LIVINGSTON.*

THE uſe of *Gypſum* as a manure, ſeems in ſome meaſure to have created a new æra in agriculture; prior to this it was generally admitted, that tho' farming might rank among the rational amuſements, it could not be conſidered as a profitable employment for thoſe whoſe avocations or diſpoſitions do not permit them to attend to that infinite catalogue of minutas, that high wages to the labourer, and the low price of produce render eſſential in our rural œconomy. The farmer's profit, being the joint reſult of the fertility of his ground and his labour, the exceſs of the firſt can only compenſate for a deficiency of the laſt. Thus the acquiſitions of the gentleman farmer, (who may lay his account in being worſe ſerved than the com-

mon huſbandman) muſt be principally derived from the means which a larger capital affords him, of fertilizing his ground.

THESE means, however, are too often beyond the reach of thoſe, even, who are willing to purchaſe them. Calcarious earths are within every man's reach, and yields ſo certain a return from ſoils to which they are adapted, as to enſure a decided profit upon the capital employed in procuring them.

IT is now three years ſince I have commenced my experiments upon *Gypſum*. I ſhall lay the reſult of them before the ſociety; tho' they may not appear new to many gentlemen preſent, they may incite others to a farther proſecution of this ſubject, and to a more regular and accurate regiſter of their experiments, than can be expected from one in my ſituation, who can only purſue agriculture as an amuſement—which muſt, like every other pleaſurable relaxation, give way to the duties which my ſtation requires.

No. 1.

[JULY, 1789.] AFTER my buckwheat was come up, I dreſſed one fourth of an acre, with a buſhel and an half of *Gypſum*, ſowing three pounds of clover ſeed. It appeared to me, that the buckwheat was ſomewhat the better for it, but a very heavy rain lodging it when in full bloſſom, I could make no accurate experiment—ſoil, a poor worn out ſandy loam.

[JUNE, 1790.] CLOVER on this ſpot extremely fine; produce at one cutting, one ox-load or half a ton; the after graſs fed down.

[JUNE, 1791.] CLOVER equal to the laſt year, except that it was more mixed with natural graſſes—after graſs worſe than laſt year, a great deal of ſummer graſs having got in.

N. B. As weighing hay immediately after it is made, would be very inaccurate, from its drying after it is houſed—I eſtimate the tons in all theſe experiments by ox-loads, at the rate of one ton to every two loads; which, however, I believe it will be generally found to exceed.

No. 2.

[1789, APRIL 10.] STREWED over one third of an acre of rye, four and an half buſhels of *Gypſum*, and ſeven pounds of red clover ſeed; the ſoil a poor ſandy loam, being the ridge of a hill, at the depth of ſix inches a ſharp red ſand which the plough often brought up.

[JULY.] CROP of rye ordinary, ſtraw uncommonly tall and ſpindled.

[SEPTEMBER.] THE clover has got to a ſurprizing height, a great part of it in bloſſom, the ground completely covered.

[1790, JUNE.] THIS clover finer than any I ever before ſaw, many of the ſtems three feet long—the whole lodging, ſo that I was compelled to cut it before it was perfectly ripe—produce, three large ox-loads. September 2d, crop very fine, being abſent when cut, I know not exact amount,

[1791.] CLOVER in every reſpect equal to the laſt year, fed down the after graſs.

No. 3.

THREE acres of ground of the ſame field, but in better heart, lying flatter, having the waſh of the adjoining hills—1787, well manured and yielding corn and potatoes—1788, wheat and clover, and left for graſs—1789, mowed for hay, produce four ox-loads of hay. April 1790, dreſſed this with ſix barrels of *Gypſum*. June, mowed for hay, produce ſeven ox-loads. Double of that produced by ſuch parts of the field as had no *Gypſum*; but half a ton an acre inferior to that which was ſown over the rye, on much poorer ground; after graſs very good; took no particular account of it, being abſent when cut.

[1791.] GRASS about equal to the laſt years; more natural graſſes, and ſome weeds make their appearance; the after crop not ſo good, owing to the extreme drought and a quantity of ſummer graſs getting in.

No. 4.

ON a lawn of ſix acres, which has lain to paſture for ten years, a loam inclining to ſand, upon a clay bottom; ſome pains had been taken to get this in good graſs, and for that purpoſe it had been manured 1787, and cattle had been foddered the winter 1788 upon it; but it ſtill produced a great quantity of daiſies and ſorrel, and changed colour at every drought. April 1790, dreſſed one half of it, except a ſtrip of 100 paces

long, and ten wide, in the middle of it, with ſix buſhels of *Gypſum* to the acre, the other half with three buſhels of *Gypſum*, and ten buſhels of unleached wood-aſhes mixed to the acre; in four weeks the effects of both were viſible when a flock of ſheep were turned upon it, and it has ever ſince, even through all the droughts of this ſummer, 1791, though cloſe fed, maintained a moſt deep and beautiful verdure, being thickly covered with white clover and ſpear graſs; the weeds are deſtroyed. No diſtinction is diſcoverable between this which had the aſhes, and the *Gypſum* without aſhes, while that ſtrip which had neither, has been parched during both ſummers, and yielded ſcarce any thing but ſorrel and other weeds.

No. 5.

On a dry hillock, conſiſting of a kind of flaty gravel, mixed with large ſtones upon a bottom of rock thinly covered with clay; its natural produce ſorrel and other cropping weeds, affording ſo thin a covering that the gravel and ſtones were always viſible through them; dreſſed April 1790, about two-thirds of an acre, with three buſhels and an half of *Gypſum;* by the 26th of May it was covered with ſuch a coat of white clover as formed a beautiful contraſt with the reſt of the hill; the weeds were entirely deſtroyed; the flowering ſtems of the white clover were ſixteen inches long, and the bloſſoms ſo thick when in full bloom, as almoſt to cover the field. As it was too ſtony to mow it was fed down with ſheep. From the

firſt of April to late in the autumn 1791, it has diſplayed the ſame beautiful appearance through the whole of this dry ſummer.

No. 6.

On three acres of ſtiff clay ground, laying very flat (part of a field that has been mown two years) dreſſed with ſix buſhels of *Gypſum* to the acre. The appearance of the graſs during the ſummer 1790, of a deeper green than that of the reſt of the field; no great difference however in the firſt cutting of graſs; the after-graſs evidently more luxuriant than the reſt of the field, but having been fed down, cannot eſtimate the difference. This ſummer, 1791, being remarkably dry, the above three acres were very ſuperior to the reſt of the field. The difference being, as I judged from counting the hay-cocks, as 7 is to 4; the beſt, however, not yielding more than one and one third ox-loads to the acre.

No. 7. On the ſame field.

[Auguſt, 1790.] Spread on a rood of the field laſt mentioned, one buſhell of pulverized limeſtone. This ſummer, 1791, the effects of it were diſcernable to an inch, both in the verdure and luxuriancy of the graſs: the difference between that and the parts adjoining were in its favor (as I judged by counting the cocks) as 7 to 4; from whence I infer, that on clay ground, eight buſhels of pulverized limeſtone, is at leaſt equal to ſix of *Gypſum*.

No. 8.

TRIED at the ſame time, the effects of pulverized limeſtone, in the proportion of ten buſhels to the acre, on part of the ſtrip which I had left on the lawn, mentioned in experiment No. 4. The ſummer 1791, it acquired the ſame verdure as the part that had been dreſſed with *Gypſum.*

No. 9. On Indian Corn.

[1791.] EIGHT acres of Indian corn were planted in a black boggy earth, from three inches to ten deep, over a ſpungy wet bottom of ſtiff red clay, intermixed with ſmall pebbles of iron ore. The whole was manured in the hills with long litter and ſtable dung; to four acres of this manure, was added at the firſt hoeing, a table ſpoonful of *Gypſum* to a hill, two acres were manured with pulverized oyſter ſhells—three rows with aſhes, three with pounded bones—a half pint of each to a hill—three with a ſpoonful of ſalt; the remainder of the field had no other manure than the dung. The ſheep breaking in eat all the ſalted hills, and damaged thoſe manured with bones ſo much as to defeat the experiment; the remainder of the field was ſo much alike as to enable me to draw no inference from it in favor of either of the manures; from thence I am led to infer, that upon this rich wet ſoil they are of no uſe.

No. 10.

[1791.] MANURED two rows of corn in my garden—ſoil a rich ſand, that has been fifteen years under garden cultivation,

with *Gypſum*, a ſpoonful to a hill—two with pulverized oyſter-ſhells—two left unmanured; the difference ſo trifling, that no inference can be drawn from it in favor of thoſe manures. This is a remarkable fact, ſince the ſoil independent of its richneſs, was of that kind which is moſt benefited by *Calcarious* manures, and confirms what the experiments of the clover upon the rye field had before intimated, to wit, that the operations of this manure is very little aided by the natural fertility of the ſoil.

No. 11.

In order to render theſe experiments more extenſive than the ſoil of my own farm would admit, I furniſhed ſeveral of my tenants with *Gypſum*, and attended to the application of it. I ſhall ſelect from them only three out of many experiments on corn, the reſult of all being nearly ſimilar to theſe.

1ſt, Was on a field of twelve acres of corn, the ſoil extremely poor, and incapable of yielding any thing without manure, except buck-wheat and rye. It was that ſpecies of land which is known by the name of ſhrub oak and pitch pine plain; five acres of this was manured with ſtable dung—three rows with pulverized oyſter-ſhells—three with unleached aſhes, half a pint of each, and the remainder with *Gypſum*, a table ſpoonful to a hill.

In the beginning of the ſummer the dunged part made the fineſt appearance; the aſhes next, but as the drought came on

the *Gypſum* and ſhells, gained upon both. The aſhed corn turned yellow, and that which was dunged was neither ſo large nor ſo well loaded, nor of ſo deep a green as that dreſſed with *Gypſum* or ſhells.

On another field of ſix acres treated in the ſame manner (the ſoil being ſomewhat better) being a light loam upon a clay bottom, I could perceive no difference between the corn produced by theſe manures. The *Gypſum* and ſhells were however put to the ſevereſt trial, as they ſtood on the top of a ridge, while the others (from which miracles were not expected) occupied the flat ground below.

The third experiment was on a loam inclining to clay, three acres was dunged with ſtable dung, put as uſual in the hills; three were dreſſed as above with *Gypſum;* two rows were left in the middle of theſe without manure, and three were treated with wood aſhes, half a pint to a hill. That without manure was ſo pinched with drought as to yield nothing; the aſhed rows were inferior by half in the ſize of the ears, and the general yield; the dunged part was good, but ſtill fell far ſhort of that which was treated with *Gypſum.*

No. 13. Flax.

[1791, 20th May.] I viewed a piece of flax, about half an acre, ſown by a poor tenant, very injudiciouſly, on a dry ſandy declivity: it looked (as might be expected) extremely ſickly;

and as it was evident that it had not ſufficient ſtamina to ſuſtain the heat of ſummer, he propoſed ploughing it up. I took upon me to be its phyſician, and preſcribed three buſhels of *Gypſum*, to be taken the next morning, while the dew was on the ground. I ſent him the doſe, which was faithfully adminiſtered, and I had the ſatisfaction of ſeeing him gather more flax from this half acre, notwithſtanding the uncommon drought of the ſummer, than any acre in this neighbourhood afforded. —*N. B.* I borrowed this hint from Mr. William Cockburne, who had experienced the beneficial effect of *Gypſum* on flax.

No. 14. Oats.

[1791.] Five acres were ſown the laſt ſpring, on the ſame kind of black ground, which I have deſcribed in experiment No. 9, being part of the ſame field: one was manured with *Gypſum*, ſeven buſhels to the acre; one with ſhells pounded, but not ground, fifteen buſhels to the acre; the reſt had no manure. I could perceive no difference, the whole field being equally good.

No. 15. Wheat.

I have made trials on three different fields of wheat, of the efficacy of this manure, but have no reaſon to conclude from any of them, that this grain received benefit from it.

No. 16.

[April 1791.] Two acres of a ſtrong loam, being part of a field of wheat, were manured with pulverized oyſter-ſhells,

fifteen buſhels to the acre: though this appeared ſomewhat better than the reſt of the field, the difference was ſo trifling as to warrant no concluſions in its favour.

No. 17.

[April, 1791.] STREWED pulverized oyſter-ſhells over half an acre of poor worn out ground, on which rye graſs had been ſown the year before; could not perceive that the graſs was benefitted by it.

No. 18.

STREWED ſeven buſhels of ground oyſter-ſhells over half an acre of rye, in the poor ſoil before deſcribed in experiment No. 11, and three buſhels of *Gypſum* on another half acre adjoining; ſowed ten pounds of red clover ſeed over both: the rye not better than the reſt of the field; the clover ſeed was bad, and came up thinly; that, however, dreſſed with oyſter-ſhells, much better than that manured with *Gypſum*. I own this ſurprized me, as the reſult of every other experiment of oyſter-ſhells on graſs (having made ſeveral upon a ſmall ſcale, which I have not noted) has been unfavourable. I, however, attribute that to the extreme poverty of the ſoil, which imbibed the oils contained in the freſh oyſter-ſhells, and thus ſuffered the air to make an impreſſion upon them, which I ſuppoſe it could not do immediately on richer grounds.

FROM the above experiments, I think we may fairly draw the following inferences.

1ſt, THAT *Gypſum* in ſmall quantities has no viſible effect on wheat or rye.

2d, THAT it is uniformly beneficial to Indian corn, unleſs it be in very rich or very wet ſoils.

3d, THAT it is beneficial to flax on dry poor ſandy land.

4th, THAT it is peculiarly adapted to the growth of clover in all dry ſoils, or even in wet ſoils in a dry ſeaſon.

5th, THAT limeſtone pulverized has ſimilar effects with *Gypſum*; whether it is better adapted to wet ſoils, I cannot yet determine.

6th, ANOTHER fact ſeems to be very well eſtabliſhed, tho' I can ſay nothing of it from my own experience, to wit, that its effects as a manure are hardly perceivable in the vicinity of the ſea.

I KNOW not whether theſe facts will be deemed ſufficient to ſerve as the baſis of a theory on the nature of this manure; but as this ſubject appears involved in difficulties which no one has yet attempted to remove, I conceive that the man who in doubtful caſes hazards even a defective theory, helps to enlighten a ſubject, by provoking others to combat his opinion. The firſt ſtep in determining how *Calcarious* or *Gypſious* earths operate as manures, is to acquire a knowledge of their conſtituent parts; and for that purpoſe I could have wiſhed for a

more accurate analyſis of them than my imperfect knowledge of chymiſtry has permitted me to make. I mixed a quart of pulverized *Gypſum* with an equal quantity of wood aſhes, and leached it with boiling water; as it evaporated, it depoſited a ſalt of a dirty brown colour, the cryſtals imperfectly formed. It was ſaturated with a ſolution of potaſhes, and, when cold, ſhot into regular cryſtals, which were ſharp at the point, and broad at the baſe, not unlike to the blade of a ſmall ſword. Though this is not the form of vitriolated tartar (which is the ſalt produced from the vitriolic acid and a vegetable alkali) the difference may have ar ſen from a metalic gas, which might have been detached from the glazing of the veſſel in which it was boiled. This I the rather imagine, as I afterwards obtained vitriolated tartar by ſuffering the liquor to evaporate ſlowly in the open air, to which it was expoſed for three weeks. Pulverized limeſtone, treated in the ſame way, gave a neutral ſalt, conſiſting of a great number of long thin needles, equally thick at either extremity. As this is the ſalt produced by combining fixed air with the vegetable alkali, it proves that the eſſential ſalt of limeſtone is *fixed air*, which ſhews a difference between that and *Gypſum* that may in certain circumſtances be of conſequence, particularly in ſoils that abound with a vitriolic acid, as many boggy ſoils do; in which caſe the limeſtone ſhould be preferred, ſince the elective attraction between fixed air and *Calcarious* earth is weaker

than that which exiſts between this and the vitriolic acid; the firſt will therefore be diſlodged, and the ſuperabundant acid of the ſoil be abſorbed by the *Calcarious* earth.

It is evident, then, that *Gypſious* earths contain an acid, capable, when united with an alkali, of forming a neutral ſalt, in which water is a principal ingredient. This earth alſo contains phlogiſton, or a principle of inflammability; as I infer, 1ſt, from limeſtones being uſed as a flux for ſubſtances which cannot otherwiſe be reduced by fire, as pure clay, &c. &c. 2d, from its having once formed part of an organized animal; 3d, from ſome experiments of Doctor Prieſtly, in which he expreſsly declares that he got a conſiderable quantity of inflammable air from chalk, by the application of heat; 4th, from the following experiment, which, being new to me, ſurprized me much: I put a few ſpoonfuls of chalk into a glaſs bottle, to which I poured ſtrong white wine vinegar, and corking the bottle, (after the firſt ebulition was over) at the end of a fortnight, I found the vinegar, from a tranſparent, converted into a dirty black liquor. This change of colour I can only account for by ſuppoſing that the phlogiſton contained in the chalk was ſet looſe by its decompoſition, and imbibed by the vinegar.

Thus, then, we find in a *Calcarious* earth, moſt of the elements that go to the compoſition of vegetables, to wit, earth, air, fire, water,—and an acid, capable, by its combination

with alkalies, of forming a ſalt which ſhall diſſolve in water, and fit all theſe ſubſtances for entering the abſorbent veſſels of plants.

[Watſon's El: 257.] VEGETABLES, on diſtillation, yield earth an acid liquor, fixed and inflammable air, an oil and an alkali. In ſome vegetables the acid and alkali are actually found united, as in tobacco, ſun-flowers, &c. and although chymiſts doubt whether the alkali is not produced from the acid in the act of combuſtion, yet I think this queſtion is decided by the analyſis of tartar, which the vinous juice of moſt plants yield, and which is found to conſiſt of an acid and an alkali. Macgraff obtained pure nitre from it by ſaturating it with nitrous acid.

FROM this analyſis of limeſtone, which only differs from *Gypſum* in the acid with which it is combined, we might be led to conclude that it aided vegetation, by being converted into the food of plants. But how is it poſſible to conceive that ſix buſhels of this manure, which does not weigh five hundred pounds, ſhould be converted into twenty thouſand weight of graſs, which it will produce in two years on the pooreſt ſoil? Why will it not have the ſame effect in the vicinity of the ſea, or on wet grounds? And whence do the plants derive their oil and alkalies, ſince neither are found in this manure?

It has been ſuppoſed, that tho' *Gypſum* in ſuch ſmall quantities may not ſerve as food, it may ſtill operate as the phyſic of plants, and ſtrengthen their power of digeſtion. This ſuppoſition is liable in my mind to ſtrong objections. 1ſt. I can hardly conceive that plants (whoſe lives it would ſeem muſt be very regular) ſhould have ſuch weakly conſtitutions as to require phyſic from their infancy. 2d. If we judge from the analogy between animals and vegetables, we ſhould ſuppoſe that a ſtimulus conſtantly applied would loſe its effects, and ultimately relax and weaken the patient. 3d. If plants were thus effected by *Gypſum*, its advantages ſhould be (contrary to the fact) comparatively greater in rich than in poor ſoils. To increaſe the appetite where there is nothing to eat, would be with Shakeſpear's Grumio, to furniſh the muſtard without the beef. 4th. As plants in wet ſoils are probably moſt ſubject to crudities and indigeſtion, it is ſuppoſable that they would be moſt benefitted by ſtimulents, and yet they receive but little benefit from *Gypſum*.

By theſe objections (which perhaps appear ſtronger to me than they otherwiſe would from the ſupport they afford to my ſyſtem) I am induced to reject each of theſe theories, in order to make room for the following, which ſuppoſes that *Calcarious* and *Gypſious* earths furniſh food to plants, without being conſumed by the ſupply they afford, that they are the ſtewards, and not the phyſicians of the vegetable family.

I HAVE obſerved that two of the ingredients that enter into the compoſition of plants, to wit, the alkali and oil, were not uſually found in *Calcarious* earths, the freſh ſhells of fiſh, and a few others excepted, from which a portion of oil and a volatile alkali may be extracted. I preſume, however, that an ample ſupply of theſe is neceſſary to the vigorous health of plants; and that *Gypſious* earths afford them by the following proceſs.

THE affinity or attraction between alkalies and the acid of *Gypſum*, is ſtronger than that which exiſts between the ſtone and its own acid. That is to ſay, the acid will leave the ſtone or earth to unite with the alkali, as appeared by the experiments I have mentioned, by which neutral ſalts were obtained by leaching pulverized *Calcarious* ſtones with the lees of aſhes.

WHEN therefore an alkali comes in contract with pulverized *Gypſum*, it will attract the acid, and combining with it and water, form a neutral ſalt, while the *Calcarious* earth, deprived of its acid, becomes cauſtic. Let us then ſuppoſe *Gypſum* pulverized and ſpread thinly over the earth, it is evident that in this caſe it expoſes a large ſurface to the action of the air; if this contains a volatile or vegetable alkali, which I ſhall by and by ſhew that it does, this alkali will ſeize upon the acid of the ſtone, and form a neutral ſalt. Salts I believe cannot chryſtalize but by the addition of water, which in their combination loſes its fluidity and becomes a ſolid body; the fluidity of water depends upon its heat; it muſt therefore before it becomes ſolid, part

with its heat, probably in the form of inflammable air. As all plants poſſeſs this, they muſt have ſome means of ſeizing upon it when brought within their reach. They will therefore either abſorb it by their leaves, or it will attach itſelf to the water that it finds in the air or on the earth, and thus be imbibed by the plant. Chymiſts ſuppoſe that this air which becomes fixed in plants, cauſes the production of oils, tho' by what combination they are not yet ſatisfied. (*Fourcroy's* Chymiſtry, 55, ſecond edition.

This then is one mode in which *Calcarious* earth may ſupply the oils and inflammable principle found in vegetables; ſince plants imbibe inflammable air and emit it pure, retaining the phlogiſton or inflammable part, which is known to be a principal ingredient in them; the acid and alkali will alſo be furniſhed, when the moiſture of the air, dews or rain diſſolve the neutral ſalts they have formed, and by rendering them liquid diſpoſe them to enter the abſorbent veſſels of plants. In this ſolution, the water which had loſt its heat where it chryſtalized, will again reſume it with great rapidity from the air in contact with it. As the repulſive power or elaſticity of the air depends like that of all other fluids upon heat, it is not unreaſonable to ſuppoſe that the ſudden aſſumption of heat from the inflammable air which compoſes a great proportion of the atmoſpheric air, will decompound it, and compel it to

depoſit its water, earth, oils, and whatever other ſubſtance is found floating in it. If inflammable air is contained in a receiver, and an electric ſpark paſſed thro' it, it may be made to depoſit a conſiderable quantity of water, which is always combined with it. In this way then oils and even earth may be ſupplied, for it is certain that the water contained in the atmoſphere poſſeſſes a portion of earth, and perhaps no other earth but this is ſufficiently atinuated to enter the abſorbent veſſels of plants. Thus a gallon of rain water diſtilled, yields about ſixty grains of *Calcarious* earth, which accounts for the encreaſe of certain plants without either earth or water, and which are ſtill found to contain both. Should it be denied that the attraction of the heat from the atmoſphere is capable of decompounding it, it will nevertheleſs be admitted that there are an infinite variety of vapours which are exhaled by the ſummers ſun, which owe their levity to heat only, and not being permanently elaſtic, muſt fall when the heat is attracted from them. Thence the fertility occaſioned by dews impregnated as they always are with a variety of heterogeneous ſubſtances; ſuch of thoſe vapours therefore as float near the earth's ſurface (and thoſe will be moſt fertile) will ſuddenly be condenſed by any extraordinary degree of cold, which the ſolution of the ſalt I have mentioned may occaſion. But the effect of the *Calcarious* earth does not ſtop here; it is not ſatisfied with a ſingle operation, but like a faithful ſteward ſtill exerts itſelf for the ſupport of the vegetable family committed to its care. This earth, when

deprived of its acid, is rendered cauſtic, and will therefore greedily imbibe the acid from the air, after which it will be brought back to its original ſtate, and will form new combinations with alkaline vapours, and the ſame proceſs will be continually repeated, till it is itſelf diſſolved in water, borne away by the air, or abſorbed by plants, to all which caſualties it is ſubject. That acids exiſt in the air is proved, 1ſt, From their being capable not only of evaporation, but of being rendered permanently elaſtic, and even in this ſtate capable of combining with alkalies, which can in like manner be rendered permanently elaſtic. From their union, a white cloud is produced, which contains a neutral ſalt. 2d, If quick-lime is kept dry, and expoſed a long time to the air, it will become effete, and loſe its cauſticity by its re-union with an acid. 3d, If a cloth moiſtened by a ſtrong ſolution of pot-aſhes is expoſed to the air, it will be covered with ſaline chryſtals of vitriolated tartar. 4th, If the earth from which ſalt-petre has been made is expoſed to the air, it will recover the nitrous acid it had loſt. In ſome parts of the Eaſt-Indies ſalt-petre is made by ſetting fire to a long graſs which grows on the declivities of hills; that aſhes ſerves as the alkaline baſe of nitre (which is a neutral ſalt compoſed of an acid and an alkali) the acid of which floats in the air and combines itſelf with the alkali, forming the ſalt which is waſhed down by the rains and received in reſervoirs at the foot of the hills, where the water is evaporated and the ſalt chryſtalized.

This part of the theory will therefore hardly admit of a doubt. The exiſtence of an alkali in the air I think is proved from the extreme volatility of ſome alkalies; from the poſſibility by heat alone of rendering them permanently elaſtic. From their being continually exhaled from burning and putrifying ſubſtances.—Dr. *Black* imputes the ruſt of metals to the action of an alkali exiſting in the air, and ſays alkaline ſalts are often collected from the corks of bottles containing acids—the atmoſphere itſelf is a compound, which differs ſo eſſentialy from pure vital air, as to contain only 28 parts in 100 of it; the reſt is fixed and inflammable air, fire, earth, water, and an infinite variety of other ſubſtances, beſides vapours that are not permanently elaſtic. The pureſt earths, the hardeſt metals, may be converted into air, and float in the atmoſphere, which may itſelf be changed into water, and water into ſolid earth.

What ſtrikes me as a farther evidence of the exiſtence of an alkali in the air, is, that ſuch parts of flint or limeſtone, as are expoſed to the action of the air and water, are always white and ſoft; flint I believe is not ſoluble in acids, but will diſſolve in alkalies; nor can the decompoſition of limeſtone, be attributed to the action of acids, ſince, as this is very gradually effected, it is to be preſumed, that if the acid in the air was ſtrong enough to expel the fixed air, it would unite with the *Calcarious* earth, and ſtill form a ſalt with an earthy baſis of a

different ſpecies. May we not then conjecture, that this change in the limeſtone is cauſed by a combination of the kind I have mentioned; and the rather, as we find when it is expoſed only to the action of the air, and not waſhed by water, that it forms ſaline effloreſcences, which ſpeak the union of alkaline acid, and earthy ſubſtances. Dr. *Watſon* tells us, that from the mortar of an old barn that was covered with theſe effloreſcences, he extracted perfect cryſtals of pure nitre, without the application of any alkali; and yet we know, that an alkali and an acid are eſſential in the compoſition of nitre.—He does not attempt to account for this.—I ſhould however preſume, that it could only happen by the lime in the mortar, having recovered a nitrous acid from the air, inſtead of the fixed air it had loſt, and that the putrid exhalations from the vegetables contained in the barn, had furniſhed the alkali, and that from the combination of theſe, with the moiſture of the air, reſulted thoſe effloreſcences that formed the nitre. Dr. *Black* aſſerts, that the effloreſcences found in damp caverns or cellars in England, contain a great proportion of *foſſil alkali*—this alkali is not found in Europe, unleſs combined with ſea ſalt, of which it makes the baſis; and yet theſe effloreſcences are derived from the moiſture of the air: does not this argue the exiſtence of an alkaline ſalt in the atmoſphere?

It may be objected, that if alkalies and acids exiſt in the atmoſphere, they would by their union form neutral ſalts in

the clouds. Tho' I by no means conſider this as a neceſſary conſequence, ſince the repulſive power of the particles of air, may keep the alkalies and acids they contain without the ſphere of each others attraction, yet I am inclined to believe, that this combination does actually take place. To the heat generated by this combination while the ſalts are forming, I attribute the variations that are felt in the degrees of heat that prevail at different times, in the ſtilleſt weather, when ſummer heat ſhould be uniform; to the ſolution of theſe ſalts, that cold which generates froſt and hail in the warmeſt ſeaſons.

THERE are places among the mountains, and in great foreſts, where froſts prevail every month in the year. There are others, which by clearing are freed from this calamity, which is known ſo often to diſtreſs the firſt ſettlers of a new diſtrict. If froſts were occaſioned merely by the influence of cold winds, the places moſt expoſed to theſe would be ſubject to them, and woods and vallies would afford a ſhelter againſt them, as indeed they often do againſt froſts which are derived from this ſource. The reaſon of the prevalence of froſt in woods and ſheltered vallies, when the general temperature of the air elſewhere is warm, I ſhould take to be the greater exhalations of thoſe ſubſtances that form ſalts, and the ſolution of them by the vapours

NOTE. THE ruſt of iron will yield a volatile alkali—ruſt is acquired by expoſure to the air. [*Black.*]

that ariſe from theſe moiſt and ſheltered ſituations. Hail too cannot be aſcribed to any other cauſe; if it owed its origin to cold only, it would be more prevalent in winter than in ſummer; it would, like ſhowers of rain, extend over large tracts of country; and it would fall from much greater heights than it generally does. But hail, like froſt, is often confined to a very narrow region, prevails in the warmeſt weather, and in long cloſe vallies at a diſtance from the ſea, more than in the open country or near the ocean. Thus France and Italy are extremely incommoded by hail-ſtorms; in England they are very rare. All theſe phenomena correſpond with the theory laid down; in ſummer are the greateſt exhalations of volatile alkalies. Theſe are more like to ariſe, and form their union with the ærial acids in vallies where the air is moſt compreſſed; in theſe ſituations they frequently meet with thoſe moiſt clouds that diſſolve them ſuddenly, and afford the water that is by the ſolution of the ſalts converted into hail. The ſalt compoſed of an acid and a volatile alkali, as ſal amoniac, diſſolves with great rapidity when it comes in contact with water, and generates a great degree of cold; while common ſalt diſſolves much ſlower, and does not generate ſo much cold by 18 degrees in its ſolution; for which (among other reaſons) hail prevails leſs near the ſea than at a diſtance from it. That ſuch ſalts are formed in the air is farther proved from the experiments of Margraff and Doctor Ratty, who both obtain a bitter ſalt from ſnow and rain

water in diſtillation, but much leſs from ſnow than from rain water. Doctor Black admits that both nitre and common ſalt are formed in the air. A farmer needs no better proof of the exiſtence of the latter in the atmoſphere on the *ſouth* ſide of the Highlands, than the indifference which cattle ſhew *there* for ſalt, and the eagerneſs with which they ſeek it at a greater diſtance from the ſea. I ſhall now endeavour to reconcile certain phenomena in the operation of *Gypſum* to this theory.

1ſt. It benefits dry more than wet ſoils.

Because *Calcarious* and *Gypſious* earths are at all times ſoluble in the water. In wet ſoils they will be diſſolved and waſh away; beſides the moiſture which invelopes the particles of *Gypſum*, protect it from the action of the air, and prevent the combinations on which this theory is founded. As lime-ſtone is leſs ſoluble in water than *Gypſum*, perhaps if applied in larger quantities, it may be more beneficial to moiſt land.

2d. It is proportionally more advantageous to poor than to rich ſoils.

1ſt. Because the putrid vegetables which compoſe a rich mold afford a ſufficient quantity of alkalies, oils and acids, but principally becauſe after the *Gypſum* has parted with its acid by combining with the alkali, as before ſuppoſed, its earth being thereby rendered cauſtic, combines with the oils with which ſuch ſoils abound, and is thus ſheltered from any further operation of the air upon it. Perhaps too the vitriolic acid inſtead

of uniting with an alkali, is attracted by the oils it finds in the earth; theſe it renders viſcious, and by its combination forms ſulphur, and thus is rather hurtful than ſerviceable—on ſuch ſoils pulverized limeſtone ſhould be preferred.

3d. It is leſs beneficial near the ſea than at a diſtance from it,

1ſt, Because the winds that blow from the ſea which are the prevalent ſummer winds, are probably leſs impregnated with thoſe alkaline ſubſtances which putrid animals and vegetables afford, than thoſe which blow over a large tract of land.

2d, Because it appears from experiments made in Ireland, that ſea ſalt is contained there both in rain and ſnow water. Sea ſalt is compoſed of the marine acid, and a foſſil alkali, to which latter the vitriolic acid found in *Gypſum* has a greater affinity than the marine acid; it will therefore decompound the ſalt and unite with the foſſil alkali perhaps, (I ſpeak with deference, not knowing the fact) perhaps, I ſay, the foſſil alkali may be unfriendly to vegetation, or not of a nature to be abſorbed by the plant. In this caſe on the ſolution of the ſalt formed with it and the vitriolic acid, the latter would be abſorbed ſingly, and the foſſil alkali being left, would form new combinations with the marine acid, which is found in the atmoſphere near the ſea, and be again converted into common ſalt, which is known to have little or no effect as a manure. That the vitriolic acid would be abſorbed, I infer from the preſence of vitriolated tartar in pearl aſhes, which ſhews that the acid muſt have exiſted

in the plants from which it was made; and from the following fact which I have ſeen in ſome writer on huſbandry:— A gentleman whoſe court-yard was overgrown with weeds, was adviſed to ſprinkle them with vitriolic acid, but to his great ſurprize he found that inſtead of killing them they grew with additional vigor. That *foſſil alkali* is unfriendly to vegetation, I infer from its not being found in any plant, ſome marine plants excepted. Perhaps in the vicinity of the ſea, if pulverized limeſtone could be afforded ſufficiently cheap, and was uſed in large quantities, it might be found beneficial, becauſe its acid or fixed air is not ſufficiently powerful to detach the marine acid from its foſſil alkaline baſe. This idea ſeems to be juſtified by the general uſe of chalk in England, and limeſtone gravel in Ireland, and the beneficial effects that are known to ariſe from the uſe of ſea ſhells applied in large quantities on Long-Iſland and elſewhere.

THERE is a remarkable fact which may perhaps be adduced to ſtrengthen my theory, and to ſhew that either the air or earth is leſs impregnated with alkalies near the ſea, than at a diſtance from it. The Long-Iſland farmers ſend annually a number of boats to collect the aſhes from the pot-aſh works along the banks of the Hudſon, and at the diſtance of two or three miles from it. Theſe they purchaſe at 2d. per buſhel; pay the expence of a cartage to the river; of a water tranſportation of 120 or 130 miles, and then cart it again two or three miles to their farms, while a North River farmer, if the aſhes were given

him, would not be at the expence of carting them three miles. This has by haſty obſervers been attributed to ignorance or indolence in the latter. The reproach is unmerited; the people on the north ſide of the Highlands are not leſs enterprizing or intelligent than thoſe on the ſouth; they are the ſame people. The fact is, that lands near the ſea derive much greater advantages from alkaline manures, than thoſe at a diſtance; aſhes will contribute to fertility every where, but much more ſo (if I can rely upon the information of intelligent farmers on Long-Iſland, compared with my own obſervations) in the vicinity of the ſea, than at a diſtance. I have myſelf never been able to procure half the graſs from an acre of land manured with 100 buſhels of undrawn aſhes, which coſt, excluſive of the expence of putting it on, £. 5, that ſix buſhels of *Gypſum* has given me from the ſame field; it is alſo on my farm the leaſt permanent of all manures; the effect of it not being viſible after the ſecond year.*

I WILL intrude upon your patience one moment longer, while I mention another fact which appears to me to ſupport my theory.

IT is generally aſſerted that *Gypſum* renders the earth black. It is well known to thoſe who have been attentive to its effects, that bare ſpots in a field that has been manured with it, will

* NOTE—THE Chancellor's ſeat at Clermont, where his experiments were made, is 120 miles from the ſea coaſt.

diſcover a great number of ſmall black ſpecks, particularly on ſandy grounds that have been wet. It is alſo known that beds of oyſter-ſhells, and the thin ſtratum of earth that covers lime-ſtone rocks, is always black, like the richeſt vegetable mould. Now as theſe ſubſtances are white when reduced to powder, from whence can they derive the power of rendering the earth in contact with them black? Unleſs in their decompoſition they attract oils from the air, or communicate the phlogiſton they contain to the moiſt earth, as the chalk appeared to do to the vinegar in the inſtance I have mentioned. We may add to this, that ground which lays over a ſtratum of limeſtone rock is leſs ſubject to froſt, and thaws earlier than any other ſoil. Both oils and ſalt have a conſiderable power in reſiſting froſt.

Should the ſyſtem I have endeavoured to eſtabliſh be true, it will follow that *Calcarious* earths are very permanent manures in proportion to the quantity employed. For as I have before obſerved, if this is ſmall it muſt be frequenly renewed, becauſe this earth is ſoluble in water, and will be carried off by it, or imbibed by the plants themſelves.

As far as experiment has gone, this opinion of its duration is fully juſtified. Oyſter ſhells, craig, marle, laſt for ages in full vigor; theſe are all different modifications of this earth.

Whether my ideas on this ſubject are juſt or not, I confeſs I take a pleaſure in thinking them ſo. I claſs in my own mind this effect of *Calcarious* earths with the proviſion which nature

in the creation of coal mines has made for after ages. I conſider it as a proof of the duration of this globe for many thouſand years to come. It is evident that the vegetable tribes flouriſhed long before men were ſufficiently numerous to make war upon them; left to themſelves for centuries, they grew, flouriſhed, faded and died, and by their death and putrefaction, covered the earth with a rich mould, from which men and other animals have hitherto drawn their ſupport. This, however, muſt gradually diminiſh; vegetable ſubſtances are not ſuffered as formerly to cover every part of the earth; to die and putrify on the ſpot on which they grew; animals take more from it than they return; every rain draws down a part of it to the hidden caverns of the earth; every ſtream and rivulet hurries it into the ſea; every fire preys upon it; every breeze is impregnated with its ſpoils. Let us not, however, tremble for the fate of poſterity; the foſſils which the ſea afford, the vaſt quarries of marble, chalk, *Gypſum*, marle, which all derive their origin from the ſame ſource, not only reſtore the loſs which the water occaſions, but, agreeably to this ſyſtem, compel the air to depoſit the ſpoils of the vegetable world, and the fires which have conſumed the old, to animate new plants.

*Letter on the Uſe of Plaiſter of Paris, as a Manure. From George Logan, Eſq. to the Philadelphia County Society for the Promotion of Agriculture and Domeſtic Manufactures. From the American Muſeum—Vol. VI. Page* 399.

GENTLEMEN,

HAVING for four years paſt, made uſe of Plaiſter of Paris, or *Gypſum*, as a manure upon variety of ſoils, and under different circumſtances—I beg leave to lay before you the reſult of my experiments, together with ſome obſervations reſpecting the nature of this foſſil. I am the more anxious to comply with my duty to the ſociety in this reſpect, becauſe many of our fellow-citizens are loſing the great advantage to be derived from the uſe of this manure; entertaining an opinion, that it does not, in itſelf, contain any nutriment to plants, but that it acts merely as a ſtimulus to the ſoil, by which, although vegetation is for a ſhort time rapidly promoted, yet the ground becomes exhauſted, and is left a dead inert maſs.

1ſt. IN the year 1785. I ſowed three acres of a light iſinglaſs ſoil, containing a little clay, with barley and clover. In the month of April, the following year, I divided the field into

* NOTE—THO' this letter of Mr. Logan has been publiſhed, yet as it contains much uſeful information, and ſhews the ability of *Gypſum* in aiding the fertility of ground in the production of wheat and rye, to which in the firſt inſtance it appears to be of little uſe, it is thought that it would ſerve as an illuſtration of Mr. Livingſton's theory.

three parts, and ſtrewed ſix buſhels of French *Gypſum* on No. 1; the ſame quantity of the American *Gypſum*, brought from the Bay of Funda, on No. 2; and left the intermediate ſpace No. 3, without any. On cutting the firſt crop, that year, little difference could be obſerved; the ſecond crop, produced double the quantity of graſs, where the *Gypſum* had been put; and the ſucceeding year, the difference was ſtill greater in favor of this manure. Early in October, 1787, the clover lay was ploughed once, about four inches deep; was ſowed with rye, and in that rough ſtate was harrowed. The rye was of a ſuperior quality, and double the quantity on No. 1 and 2, of that on No. 3. After harveſt, the rye-ſtubble was ploughed, and ſowed with buck-wheat, when a ſtriking difference was ſtill obſervable in favor of the *Gypſum*, and which continues in the preſent crop of Indian corn.

2d. In April, 1787, I ſowed three acres of potatoe-ground (a light loam) with barley and clover. Juſt as the barley was above ground, ſome *Gypſum* was ſtrewed diagonally acroſs the field, about eight feet wide. Little or no difference could be obſerved in the barley; but in the month of September following, there was a ſtriking difference in the clover, in favour of the manure, which would have afforded a good crop of hay, whilſt the remainder of the field was but indifferent. I have frequently put *Gypſum* upon grain, without obſerving any immediate difference in the appearance of the crops.

3d. In April, 1786, ſix acres of a poor iſinglaſs ſoil, ſituated on Germantown hill, were ſowed with oats, the ground not having been manured for twenty years; it produced a crop not paying expences. In April, 1787, one half of the field was covered with the *Gypſum*, ſix buſhels to the acre. The latter end of the ſame ſummer, that part, on which the manure had been put, produced good paſture of blue graſs and white clover, whilſt the remainder afforded little but a few ſcattered weeds. In October, the field was ploughed once, and ſowed with rye; at harveſt, the former produced ten buſhels to the acre, the latter not above five.

4th. A Field of 15 Acres, a light loam, was, in April, 1784, ſowed with barley and clover, the produce only twenty buſhels to the acre, the ground not having been ſufficiently manured. In 1785, it produced a good firſt, and a tolerable ſecond crop of clover. In 1786, the firſt crop but tolerable; the ſecond very indifferent and therefore paſtured. In the ſpring 1787, I wiſhed to try if *Gypſum* would not renew the clover. In the month of April, the whole field was covered with *Gypſum*, ſix buſhels to the acre, except the width of twenty feet, through the middle of the field. St. John's wort, mullain, and other weeds, had taken ſuch poſſeſſion of the ground, that, although the manure produced a great luxuriance of graſs, yet, being full of weeds, it did not anſwer for hay; and therefore was paſtured until October 1788: the whole was then ploughed 8 inches deep, with a ſtrong three horſe Dutch Plough: laſt

April, it was well harrowed, and croſs ploughed, four inches deep, with a light two-horſe plough, leaving the ſod at the bottom. The field was ſowed with ſpring barley; at harveſt, the difference of the crop was aſtoniſhingly great in favour of the part where the *Gypſum* had been put, two years before. This ground is now under wheat and winter barley, which have a promiſing appearance: the rotted ſod, being turned up and mixed with the ſoil, affords a ſtrong nouriſhment to the preſent crop.

5th. I PUT a quantity of *Gypſum*, three years ago, on ſeveral ſmall patches of a tough ſod; it produced a difference in the ſtrength of vegetation, which is ſtill obſervable.

FROM the above recited experiments it appears—

1ſt. THAT there is no difference between the European and American *Gypſum*.

2d. THAT *Gypſum* acts as an immediate manure to graſs, and afterwards in an equal degree to grain.

3d. THAT one dreſſing will continue in force ſeveral ſucceeding crops.

GYPSUM not producing any remarkably beneficial effects, when uſed as a top dreſſing to grain, may ariſe from two cauſes; firſt, from the ſmall quantity made uſe of, which is loſt in the rough ground; and ſecondly, from the ſhort time of its application. It has been found of advantage to Indian corn, but in

this caſe, it is abſolutely neceſſary to apply it immediately to the corn, as it appears above ground, and that in a conſiderable quantity—I have put it on graſs ground every month in the year, except during the ſeverity of winter, and have found, that early in April is preferable to any other ſeaſon; at which time, the graſs juſt ſhooting, the ſmall particles of the *Gypſum* are retained about the roots, and prevented from waſhing away. On ſtiff clay ſoils, it will produce an increaſe of vegetation, but not ſufficient to pay the expence of the manure.

*Utility of preparing Seed-Oats with Plaiſter of Paris. Addreſſed to Samuel Powel, Eſq, Preſident of the Philadelphia Agricultural Society.*

Sir,

PERMIT me through you to lay before the Agricultural Society, the reſult of the following little experiment, ſo far as I have as yet been able to aſcertain it.

Late in the month of April laſt, having a piece of ground in the vicinity of the borough of Lancaſter, prepared to be ſown with oats, which I ſuppoſed would take ſixteen buſhels of ſeed, the evening before it was to be ſown, I had eight buſhels put into a trough, and covered with water. The next morning the water was drawn off, and the oats laid in a heap to drain, for a ſhort time, ſay half an hour; then Plaiſter of Paris in powder was thrown on, by ſmall quantities at a time, and mixed with the oats, till they acquired a ſufficient degree of dryneſs to be ſown evenly; in this proceſs one buſhel of the Plaiſter was conſumed: the ſeed thus prepared, and dry ſeed from the ſame original heap, were ſown on alternate lands throughout the field. The whole came up together, and in due time, and no difference was viſible for ſeven or eight days. From that time forward the diſtinction became very evident; the oats on the land ſown with the prepared ſeed were much more luxuriant and of a deeper green, until they began to ripen. On the

ſecond inſtant they were cut, being then perfectly ripe, while thoſe on the lands ſown with the unprepared ſeed were yet green, the heads much ſmaller, and promiſing in every reſpect a worſe crop.

On the eighth I left home. They were then unfit to cut, and appeared as if they would not be ripe for five or ſix days after—To the facts above ſtated, many of my neighbours are witneſs.

I mean to have the oats, produced from the prepared and unprepared ſeeds, threſhed ſeparately, to aſcertain with preciſion the difference in the quantity and quality of the produce, which ſhall be communicated to the ſociety, ſo ſoon as conveniently may be.

I have the honor to be,
Sir,
your obedient,
humble ſervant,
EDWARD HAND.

*Philadelphia, Auguſt* 17, 1790.

# COMMUNICATIONS

## MADE TO THE SOCIETY, RELATIVE TO

# *MANURES.*

By the honorable EZRA L'HOMMEDIEU, Esq.

LITTLE or no attention before the late war, in Suffolk county and other parts on Long-Iſland, was paid to making manure; the land was eaſily tilled, and in moſt parts by cropping with wheat was ſo reduced, that on an average not more than five or ſix buſhels was raiſed to the acre. This mode of huſbandry was ſtill purſued, and altho' the land was gradually impoveriſhed, the farmer found the crop, altho' ſmall, more than would pay for his labour and expence. The wheat inſect, or Heſſian Fly, as it is commonly called, put an end to this kind of huſbandry, and in that reſpect has proved a bleſſing inſtead of a curſe. No other way being found to prevent the injury to his crop by this inſect but by highly manuring the land, great attention ſince has been paid to making manure, which in many parts of the country has increaſed ten fold. This addition has been made by green ſea weed taken directly from the creeks and bays; by drifted ſea weed prepared in different ways; by making a comport with yard dung and turf; by mud

taken from creeks and ſwamps; by leached aſhes; and by the fiſh called manhaden or moſbankers.

### *Experiments made with Green* Sea-Weed.

A FLOAT is made of pine boards of between one and two tons burthen, at the expence of about four dollars, into which the ſea-weed from the bottom of the creek is raked with a wooden rake of ſimple conſtruction, the head being nine inches long and two inches ſquare; the teeth about ſeven inches long, and the handle ſix or eight feet, according to the depth of the water where it is uſed. A man will get four ox-cart loads of this weed in a day, and land it on the ſhore, for which you pay fourteen pence per load. It is commonly thrown from the boat in large long heaps, not unlike in appearance to long hay ſtacks; in this ſituation it ſoon heats, and by a fermentation which takes place, the parts in a ſhort time are ſo ſeparated as to be too fine to be loaded with pitch-forks. Sometimes this weed is taken directly from the boats, carted and ſpread on the land deſigned for a crop of wheat, and immediately turned under the furrow. There appears to be no material difference in the crop produced from the weed taken directly from the creek and ploughed in, and that taken from the heap. Twenty-five buſhels of wheat have been produced from an acre with thirty loads of this manure, and fifteen buſhels from twenty loads on poor lands, which otherwiſe would not pay for the labour and expence of tilling; but this quantity is too much on an average;

on ſuch poor land I ſhould think that thirteen buſhels to twenty loads of this weed, taking one year with another, is about the common produce. Many farmers are of opinion that one load of this manure is equal to a load of cow-yard dung for raiſing of wheat; but as cow-yard dung is various in reſpect to its quality, it is difficult to determine the relative value of each as a manure; within two years I have uſed more than two hundred loads of this manure for wheat only, but do not find it equal to good cow-yard dung by five loads in thirty. I have ſeen thirty buſhels of rye from one acre on poor ſandy land; no account was kept of the number of loads put on this land; I ſuppoſed there muſt have been near forty. It is a common obſervation, that after the crop, the land manured with this weed does not produce graſs equal to that manured with yard dung. This is owing to the graſs ſeed being carried on the land with the yard dung, when there is none in the ſea-weed; and a larger quantity of hay-ſeed ought to be ſown on the land manured with this weed, than on that manured with yard dung. This ſea-weed is made uſe of as a manure in raiſing Indian corn; being taken from the creek in the ſummer, it continues in the heap till the next ſpring; it is then ploughed under the furrow, about twenty tons to the acre, and is found in ſome reſpects ſuperior to any other kind of manure for the raiſing of Indian corn, as it prevents worms and injury from drought. The laſt ſummer being very dry, much Indian corn was cut off by that

means; but where the lands were manured by this weed, the corn was not affected.

THIS green ſea-weed, taken directly from the creeks, and put into hog-pens, and ſome dirt or turf thrown thereon, and being trodden and mixed together by the hogs, within a few weeks becomes very fine, when it is thrown out and more put in; in this manner large quantities may be made, which is generally uſed for dunging corn in the holes, and is a very good manure. It is to be obſerved, that this weed comes up in the ſpring, from the roots, and about harveſt, gets its full growth and falls down; by raking it from the bottom at that time, you get it when it is full of its juices, but if neglected, it loſes its virtue, becomes light and drives on ſhore, when it is but of little value to plough under the furrow. The raking the bottom, although many roots and conſiderable mud is taken up, yet it does not prevent a crop the next year: on the contrary, the crop is found to be better for raking the bottom the year before. It is further to be obſerved, that this weed growing on a muddy bottom, in a creek, is far preferable to that growing on a ſandy bottom, or on a muddy bottom in a bay.

*The uſes made of drift* Sea-Weed *from* Bays *and* Creeks, *as a* Manure.

THE drift ſea-weed from bays, being waſhed by the waves, driven on ſhore, and there expoſed to the ſun, loſes its juices, and ſoon becomes a ſalt dry huſk, and if in that ſtate turned

under the furrow, will continue there twenty years. The beſt uſe made of this dry drifted weed, is to cover your wheat as ſoon as ſown; this anſwers a good purpoſe, in keeping the wheat warm in the winter, and prevents its being killed by froſts. It anſwers a good purpoſe as a litter for horſes, which being mixed with the horſe dung and trod to pieces, and thrown out into a heap, is found to anſwer a good purpoſe. A few horſes in the courſe of a winter, will make large quantities of this manure. The drifted ſea-weed from creeks and bays, if taken green and put under the furrow, anſwers the purpoſe of a manure, in proportion to that raked from the bottom of creeks and bays, as about two loads to one. It is generally carried into cow yards for litter, there being trod to pieces by the cattle, and abſorbing their dung, adds much to the quantity, and becomes a good manure. But it is uſed to the greateſt advantage in hog-pens. The general mode of preparing this manure, is as follows: Your hog-pen is made without a floor, contiguous to a hog-houſe or ſhed, where the hogs may be dry whenever they pleaſe; the pen ſhould be hollowing in the middle, ſo that rain will run into it and ſtand for ſome time, by which means the ſea weed is kept wet and waſhed from the ſalts, and ſooner rot than otherwiſe it would do. This ſea-weed is thrown into the pen as often as neceſſary, with turf or rich dirt and any kind of green weeds; very large quantities of manure may be made in this way, which is much better than cow-yard dung, eſpecially for dunging corn in the holes, as it prevents the injury

done to corn by grub worms and other inſects. Mr. *Joſeph Glover*, a perſon in my neighborhood, informs me, that laſt year, with two hogs kept in a pen the whole year, by throwing in the pen the drift ſea-weed, turf, rich dirt and green weeds, as often as occaſion required, he made twenty ox-cart loads or tons of good manure, which he computes to be worth twenty dollars, equal to his two hogs when fatted; ſo that his pork coſt him nothing, except his trouble of tending his pen. An equal quantity and perhaps more manure, may be made by hogs in a country, remote from the ſea, by putting in the pen, the freſh graſs growing on flats in rivers, (which not being impregnated with ſalts, will ſooner rot than ſea-weed) and by adding turf or rich dirt, and any vegetables not fit for fodder.

### *Of* Compoſt *made with* Yard-Dung *and* Turf.

The turf in ſtreets where hogs and cattle run, is very rich, and if plouged up in the ſpring and put into heaps like ſmall hay cocks, by abſorbing the nitre in the air, and by a fermentation of the roots of the graſs which takes place, it becomes a good manure, eſpecially for wheat. This turf, or any other turf which abounds with the roots of graſs, is uſed in making a compoſt with cow-yard dung: the dung is carted from the yard as ſoon as you have done foddering your cattle—you firſt make a bed of this turf, of about ten loads, if you mean to make a heap of one hundred tons; on this bed you cart ten loads of dung, then cover the ſame with four or five loads of turf, made fine by ploughing and loading it in the cart, you go on in that

proportion till you compleat your pile, which ought to be flat on the top, and well covered with this turf or other rich dirt, ſufficient to keep off the ſun from the dung. This manure is fit for uſe the next ſpring; but if not wanted at that time, it will be beſt to make another heap of the ſame, by cutting it down and throwing it with ſhovels into another heap; by this means another fermentation takes place, and the whole is better mixed, and is a very fine manure for wheat, corn or graſs. Great addition by this means is made to the quantity of your yard dung; and by this means alſo, you prevent any loſs of your dung by the moiſture being exhaled by the ſun during the ſummer; you have a clean cow-yard, which being well littered abſorbs the dung and ſtale of the cattle during the warm ſeaſon of the year, and becomes ſufficiently fine to cart out before winter. It is the common practice of farmers to cart out their dung in the fall, and lay it on or near a piece of ground they propoſe to till the next year; it lies in that ſtate, expoſed to the rains about ſix months, which muſt waſh away much of its virtue.

### *The* Manure *of* Mud *taken from* Creeks *and* Swamps.

Mud from the creeks on Long-Iſland and on the ſea coaſts of ſome parts of Connecticut, has been made uſe of as a manure with ſucceſs in ſome inſtances, when in others no benefit is experienced. This is owing to their uſing two kinds of mud. In order to determine which is fit for a manure, if you run a paddle, or pole, into the mud, and it ſticks ſo faſt that it is

with ſome difficulty you pull it out, you may determine that mud unfit for manure, it being only loam, or clay ſoaked with water; but if your paddle, or pole, is drawn out eaſily, the mud is fit for manure. This mud may be taken from the bottom, in floats uſed for ſea-weed, as above deſcribed. A ſort of hoe is uſed to take up this mud from the bottom, made by riveting an old hoe to an old iron ſhovel, at the top; by putting a handle in the eye, you have the inſtrument with which you load a float almoſt as ſoon as you throw it out when brought to ſhore. A man may get as many tons of this mud in a day as he can of ſea-weed: it is carted into heaps, which ſhould not be ſo large as to prevent the froſt from penetrating through the whole. This mud being taken out in the ſummer, and expoſed to the froſts during the winter, in the ſpring becomes as fine as leached aſhes, and is a good manure, eſpecially for graſs: being ſpread in poor loamy land, it brings up white clover, ſimilar to aſhes, though it takes a larger quantity. I dunged corn in the holes with this manure, but it did not anſwer; I put too much in a hill. This is likewiſe a good manure for wheat, but has not yet been much attended to; but the probability is, that it will be found equal to any other manure which can be procured at ſo ſmall an expence.

The mud taken from ſwamps is often uſed as a manure; I have known ſome which have proved very good, others again have not anſwered the purpoſe. The beſt I have ſeen are thoſe which, being cleared and drained, produce graſs, turnips,

and other vegetables. Some of the ſwamps have a ſoil, or ſort of manure, ſome feet deep, and yield great quantities of good manure for wheat: Although the ſwamp be rich, and will produce extraordinary crops, yet the advantage of carting it away on poor land far exceeds any profit you can otherwiſe make from it. By carting it into heaps, and letting it lie expoſed to the froſts during the winter, it becomes mellow, and in many inſtances is found nearly equal to yard-dung. Some ſwamps, to appearance, look well, and promiſe to be good manure, when, on experiment, they prove uſeleſs. I know not of any way to determine without experiment—which may be done at a very ſmall expence.

## *The* Manure *of* Leached Aſhes.

The manure of leached aſhes has been much uſed on Long-Iſland, and in Connecticut, near the ſea coaſts, and is found to ſucceed beſt on dry loamy lands, or loam mixed with ſand. It is generally purchaſed on the North river, and on Connecticut river; it coſts, at the eaſt end of the iſland, nine ſhillings for forty buſhels, or one cart load, and is then carted by many farmers ſix and ſeven miles, to put on land as manure, and coſts them ſixteen ſhillings per load, including the carting; and yet the effects of it are ſo great and laſting, it has been conſidered as the cheapeſt manure you could procure. Of late years, the demand for aſhes has been ſo great, by being more uſed than formerly, that it is difficult for farmers on the ſea coaſt to ſupply themſelves with it in any conſiderable

quantities. Ten loads of this manure, on poor land, will produce ordinarily twenty five buſhels of wheat, which exceeds by five dollars the expence of the manure, and the five dollars pays for the expence of labour in raiſing the crop. The land is then left in a ſtate for yielding a crop of hay of between two and one and an half tons per acre, which it will continue to do for a great number of years. In ſhort, no manure has been found, as yet, to continue ſo long in the ground as aſhes. What will be the reſult of the firſt manure in that reſpect is uncertain.

The ſcarcity of aſhes will be in proportion to the ſcarcity of wood on the ſea coaſts, where it anſwers beſt for a manure, and in a few years cannot probably be procured in any conſiderable quantities. I would propoſe to the ſociety to order an experiment to be made as a ſubſtitute for this article, and which will be of the ſame kind of manure; which is, to buy in New-York a barrel of the ſalts of lye, which it is ſaid will coſt fifty ſhillings; let a bed of earth be made in the field where you propoſe to uſe the manure; diſſolve this barrel of ſalts in any quantity of water which ſhall be thought ſufficient to impregnate five loads of dirt, and with a watering pot ſprinkle your bed of earth; then put on more earth, and water the ſame with the diſſolved ſalts, and ſo on, till the whole five loads partake of the ſalts in as equal a manner as may be; perhaps after ſome days it will be beſt to remove the whole, by ſhovelling the ſame into another heap for the purpoſe of mixing it more equally; then cart the

whole on half an acre, as manure for wheat, to be uſed in the ſame manner as you would the five loads of leached aſhes. If this ſucceeds, and is equal to five loads of aſhes, it will be a valuable acquiſition to the farmer, as theſe ſalts may be obtained in any quantities; the expence of tranſportation by water or land is inconſiderable, and will finally be a much cheaper manure than leached aſhes. This experiment might be tried on a ſmaller ſcale; but as you cannot well purchaſe a leſs quantity of thoſe ſalts than a barrel, it is propoſed to uſe ſo much in the experiment, which will fully determine its relative value with aſhes.

## *The* Manure *of* Fiſh.

Experiments made by uſing the fiſh called Menhaden or Moſbankers as a manure, have ſucceeded beyond expectation, and will likely become a ſource of wealth to farmers living on ſuch parts of the ſea coaſts where they can be taken with eaſe, and in great abundance. Theſe fiſh abound with oil and blood more than any other kind of their ſize. They are not uſed for food, except by negroes, in the Engliſh Weſt-India iſlands; and the price is ſo low, that it will not anſwer to cure them for market. They are eaſily taken in the month of June, when they come near the ſhores in large and numerous ſchools. Theſe fiſh have been uſed as a manure in divers ways, and on different ſoils.

1ſt. In dunging corn in the holes: put two in a hill in any kind of ſoil where corn will grow, and you will have a good crop. The Indians on the ſea coaſts uſed to dung their corn with Wilkes and other ſhell fiſh, and with fiſh if they could get it.

2d. By ſpreading thoſe fiſh on the ground for graſs, a good crop is produced: put them on a piece of poor loamy land, at the diſtance of fifteen inches from each other, on the turf expoſed to the ſun and air, and by their putrefaction they ſo enrich the land, that you may mow about two tons per acre. How long this manure will laſt, experience has not yet determined.

3d. An experiment was made the laſt ſummer by one of my near neighbours, Mr. *Jonathan Tuthill*, in raiſing vegetables with this fiſh manure. About the firſt of June, he carted near half an ox-cart load of thoſe fiſh on twenty feet ſquare of poor light land, being loam mixed with ſand. The fiſh he ſpread as equally as he could by throwing them out of the cart; being expoſed to the weather they were ſoon conſumed: he then raked off the bones to prevent their hurting the feet of the children who might go into the garden, and ploughed up the piece, and planted it with cucumbers and a few cabbages. The ſeaſon was extreme dry, and but very few cucumbers were raiſed in the neighbourhood, except what grew on this ſmall piece of ground, and here the production exceeded any thing that had been known; by his own computation and that of his neigh-

bours, this twenty feet ſquare of ground produced more than forty buſhels of cucumbers, beſides ſome fine cabbages. I meaſured the ground myſelf, and make no doubt of the quantity adjudged to have grown on the ſame.

By putting theſe fiſh on the land for manure, expoſed to the air till they are conſumed, there can be no doubt that a conſiderable part of the manure is loſt by the effluvia which paſſes off the putrified ſubſtance, as is evident from the next experiment.

4th. Mr. *Joſeph Glover*, a farmer in Suffolk county, having a ſmall poor farm, for a few years paſt has gone into the practice of making manure with theſe fiſh for the purpoſe of enriching his land, which is a loamy ſoil, dry, and in parts light. He firſt carts earth, and makes a bed of ſuch circumference as will admit of being nine inches thick; he then puts on one load of fiſh, then covers this load with four loads of common earth; but if he can get rich dirt, he then covers it with ſix loads, and in that manner makes of fiſh and earth a heap of about thirty loads; the whole maſs ſoon becomes impregnated and turns black. By experience he finds that fifteen ox-cart loads of this manure is a ſufficient dreſſing for one acre of his poor land, which produces him thirty buſhels of the beſt wheat by the acre; and the next year from the ſame land ſown with clover ſeed, he has cut four tons of hay, which he computes at two loads and an half by the acre. The expence of making this manure where

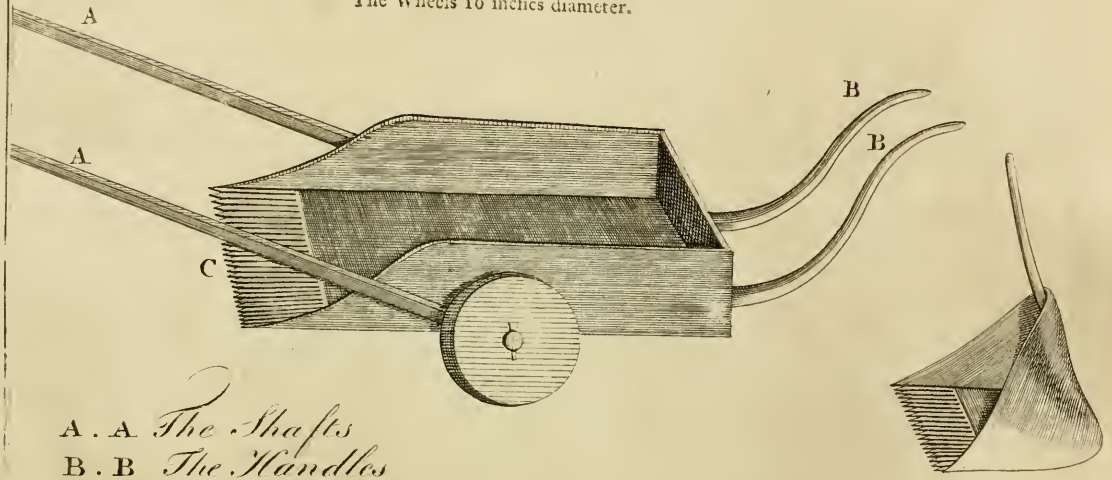
the fiſh are plenty, cannot exceed three ſhillings per ton, and is the cheapeſt manure, conſidering its quality, of any yet known, provided it is durable, which cannot yet be determined. On ſome parts of Long-Iſland thoſe fiſh are taken in ſeins, and carted ſix and ſeven miles for the purpoſe of manure, and is found to be a very profitable buſineſs.

Mr. *Glover* relates a circumſtance which is curious, and confirms ſome experiments made by Doctor *Prieſtly*, and at the ſame time ſhews that you derive leſs benefit from thoſe fiſh when expoſed to the air, than when covered with earth. He made a heap compoſed of thoſe fiſh and earth, in the manner above related, near a fence where a field of wheat was growing on the oppoſite ſide. The wheat near the heap ſoon changed its colour, and grew luxuriant; and at harveſt yielded near double the quantity to the other parts of the field. He is confident that the wheat could derive no nouriſhment from the heap or compoſt by its being waſhed by rains to the ground on the other ſide of the fence where the wheat grew, and could be effected only by the effluvia ariſing from the putrefaction of the fiſh, and abſorbed by the leaves of the wheat.

A. A. The Shafts, 4 feet 4 inches in length.
3 feet 9 inches asunder.
18 inches deep.

B. B. The Handles, 3 feet long.
22 inches asunder.

C. The Fingers or Teeth, 13 inches long.
The Wheels 16 inches diameter.




A . A *The Shafts*
B . B *The Handles*
C *The Fingers or Teeth*

*Maverick Sc.*

# ON THE RAISING OF *RED CLOVER SEED.*

By EZRA L'HOMMEDIEU, Esquire.

RED Clover Seed of late years has become an article of exportation, by which the price has encreaſed, and the production become very profitable to the farmer. More red clover ſeed is carried to market from Suffolk county than from the whole ſtate beſides. It is not uncommon for a farmer in that county to ſell thirty buſhels of this ſeed in a year, which in many inſtances brings him more clear profit than all the reſt of the produce of his farm. As the raiſing of this ſeed is but very little attended to in other parts of the ſtate, I ſhall deſcribe the manner of raiſing it in that county. It grows beſt on a light ſandy ſoil, on a light loamy ſoil, or on a ſoil of light loam mixed with ſand; the ſeed is collected both from the firſt crop and from the ſecond crop; but the largeſt quantity is procured from the firſt crop. By ſowing clover ſeed, three or four pounds to the acre, on light loamy ſoils (where you ſow wheat or rye) which yield eight or ten buſhels to the acre, the red clover will not be profitable to mow, but ſtanding thin on the ground, the heads will be well filled with ſeed; theſe fields are kept up the next year till the ſeed is collected; when you perceive about one half of the field to have changed its colour by the drying

of the clover heads, you then begin to collect them, which is done by a machine invented at Brookhaven, in Suffolk county. It is drawn by a horſe and guided by a man or boy, who will collect from the field by this means, the heads of clover growing on five acres in one day: the price of collecting is two ſhillings and ſix-pence per acre. This machine is of ſimple conſtruction; it is nothing more than an open box of about four feet ſquare at the bottom, and about two feet high on three ſides; one part, which we may call the fore part, is open; on this part is fixed fingers ſimilar to the fingers of a cradle, about three feet long, and ſo near together as to break off the heads from the clover ſtocks, which are taken between thoſe fingers; the heads are thrown back into the box as the horſe walks on. The box is fixed on an axle-tree, ſupported by two ſmall wheels of about two feet diameter; two handles are fixed to the box behind, by which the man or boy at the ſame time he guides the horſe, lowers or raiſes the fingers of the machine ſo as to take off all the heads from the graſs: as often as the box gets full of heads, they are thrown out, and the horſe goes on again.

Another inſtrument is uſed for collecting hay-ſeed, which is called a cradle; it is made of a piece of oak board of about eighteen inches long and ten broad; about nine inches of this board, which we may call the fore part, is ſawed into fingers of about nine inches long; a handle is fixed into the board on the back part, almoſt at right angles, inclining towards the fingers; a cloth is put round the back part of the board, which is cut

rounding, and raiſed on the handle; this collects or keeps from ſcattering the heads which are ſtruck off from the graſs by this cradle; different ſizes are uſed, leſs than the above deſcribed, for women and children, who collect large quantities in this way.

On rich lands ordinarily no ſeed is raiſed from the firſt crop. If the land is highly manured, or otherwiſe very good, the firſt crop of graſs is ſo thick that it yields no ſeed worth gathering: the ſecond crop being ſhorter and thinner, is commonly well ſeeded. Sometimes conſiderable quantities of ſeed is gathered from the firſt crop, on the land where the wheat is cut the ſame year; the ſtubble prevents the clover from growing too thick to produce ſeed.

The ſecond crop of graſs on good land is mowed ſo high as to cut off the heads of the clover, and as little of the graſs as poſſible; a man will mow two or three acres in this manner in a day. The time of mowing is when at leaſt one half of the heads are turned or become dry; it is then raked immediately into ſmall heaps or cocks, of the quantity of about the bigneſs of a large corn baſket.

The machine uſed for collecting this ſeed, and drawn by a horſe, is ſeldom made uſe of in collecting from the ſecond crop; thoſe who do not own a machine, ſuppoſe the expence of hiring, with the loſs of ſeed trod down by the horſe, and levelled with the wheels, being near equal to the expence of mowing the ſecond crop.

All the heads of clover, in what manner ſoever collected, ought to be put into ſmall heaps or cocks in the field, and there expoſed, that the huſk may rot (which generally takes about three weeks in Suffolk county) otherwiſe it will be with great difficulty to get out the ſeed. Some attention ought to be paid to theſe heaps or cocks, leaſt they ſhould rot too much next to the ground; it will ſometimes be neceſſary in caſe of much rain to turn the heap; by rubbing the heads in your hand it may eaſily be perceived when the huſk is ſufficiently rotten. Whenever it is found the heaps are ſufficiently rotted and dry, they are carted into the barn, and whenever it is found convenient the ſeed is threſhed out on the barn floor, and cleaned with a wire riddle.

The greateſt yield I have known was one buſhel and four quarts from one quarter of an acre of land—but this produce was extraordinary. This ſeed is ſown in different quantities, according to the richneſs of the ſoil, and the uſe that is propoſed to be made of the graſs. If ſeed is to be collected from the firſt crop, the clover ſeed is generally ſown with the wheat on lands which produce from eight to twelve buſhels by the acre. The graſs on ſuch lands will not be too thick to produce ſeed from the firſt crop. Some farmers inſtead of ſowing the clover ſeed on ſuch grounds at the time of ſowing their wheat, ſow it the laſt of February or the firſt of March, on a light ſnow. If your land be rich, and you mean to ſow the firſt crop and collect ſeed from the ſecond, eight pounds is not too much to put

on one acre. If this is all ſown at the time of ſowing the wheat, it may be killed with the winter; if it is not, ſo much graſs commonly injures the crop of wheat; if it is all ſown the laſt of February or the firſt of March, and a dry ſeaſon ſhould follow, while the roots are young and tender, then the crop of graſs will be loſt. I have found it the ſafeſt way, to ſow one half the clover ſeed propoſed for an acre, at the time you ſow the wheat, and the other half on the ſame land in the laſt of the winter or the firſt of the ſpring.

Some farmers a little before they cart out their dung from their cow-yards to dung wheat, ſcatter the heads of clover all over the yard, ſufficient to ſeed the land they propoſe to dung; the clover heads being trodden into the dung by the cattle, and otherwiſe mixed by carting out, ſpreading and ploughing in the dung, the ſeed comes up exceeding well, and being deeply rooted is not ſubject to injury by drought or froſts. The only objection to this mode is, that the quantity of graſs is apt to hurt the crop of wheat.

# A LETTER ON THE *MANUFACTURE* OF *MAPLE SUGAR*,

ADDRESSED TO THE AGRICULTURAL SOCIETY.

BY THE HONORABLE JUDGE COOPER, ESQUIRE.

I AM happy that I have it in my power to ſubmit to the conſideration of this ſociety, my collected indeas on the vaſt importance of facilitating the manufactory of ſugar within this State. I ſolicit that thoſe here collected for the purpoſe of diffuſing uſeful knowledge will not criticiſe on the mode in which I bring forward my meaning, but to hear, with a degree of patience, the enquiries obtained by the dint of induſtry and experience, of the vaſt importance of the ſugar tree of America.

IN all ſocieties like this, it is too frequent that its members (for the ſake of doing) call the attention of each other to objects ſomething like that of refining on common ſenſe; whereas the real utility of our inſtitution is to correct errors now in practice, and deliver to the public rational principles for common uſe.

To make it appear that the importation of ſugar from the Weſt-India iſlands can be diſpenſed with, and an ample ſupply for the conſumption of the United States, manufactured from the juice of this invaluable tree, is the buſineſs now before you.

To have nothing more than bare aſſertion to ſupport my declarations, would leave room for a doubt to ariſe, but happily that is not the caſe. Emboldened by the repeated teſtimony of ocular demonſtration, which I have for ſeveral preceding ſeaſons laid before the eye of the public, do I now report to the members of this uſeful inſtitution, that a full ſupply of that article of life may be manufactured within the boundaries of this State, for the conſumption of the United States; and the firſt ſtand that I ſhall make to defend this report is on the following ſimple, ſhort, but well founded calculation, to wit:—If one man can procure from a tract of country leſs than ten miles ſquare, fifty thouſand pounds of ſugar, what could be collected from fifteen millions of acres? Upwards of eleven millions of pounds, equal to eleven thouſand hogſheads of a thouſand weight each; a much greater quantity than has ever been landed in one ſeaſon at all the ports in America. I know that the idea has an extravagant appearance, and will be thought by moſt people an enthuſiaſtic, fanciful and viſionary plan; but let reaſon uſurp the throne of prejudice, then theſe calculations will ſtand the teſt; allow the firſt propoſition to be juſt, all the reſt follows of courſe; none can deny that the quantity firſt mentioned has been repeatedly produced from within the boundary of ten miles ſquare, nor was one fiftieth part of the trees within that territory made uſe of; but this is a mere aſſertion without proof. I only court that what has been already ſeen may be believed; then, if my report is

contradicted, better evidence muſt be produced than the fact itſelf.

That there is that quantity of unimproved land in the northern and weſtern part of this ſtate, is obvious to all who are acquainted with its geography; that theſe trees are plentifully found over the face of the whole country, will not be denied by any perſon acquainted with the nature of our foreſts; then nothing remains but to point out the mode in which the manufactory can be promoted, without loſs to the proprietor; which is, that the overſeer of large tracts of land will cauſe them to be ſettled by families, and ſupply them with utenſils ſuitable for carrying on the manufactory; make them debtors for the ſupplies iſſued out, and credit them for the returns of ſugar at a price that will bear tranſportation; no loſs can be admitted in this mode of carrying on the buſineſs; on the other hand certain profit. But another objection ariſes—Will not the lands produce more to the huſbandman on the principles of grazing cattle or ſheep, making butter or cheeſe, raiſing wheat, hemp, barley, &c. for all which thoſe lands are excellent in their nature? I anſwer, No. The whole produce of the tract of country firſt ſtated paſſes through my hands; and certain it is, that the whole wheat, cheeſe, butter, beef and every thing that can poſſibly be reared, is not equal in value to the ſugar produced from the ſame lands, which is a fair and concluſive argument. Some may ſay a ſufficient portion of the country is not now improved, and much more produce may be reaſonably

expected from the face of the country in years to come than at present—granted; but juſt ſo may the manufacture of ſugar be increaſed. One acre of good ſugar land, properly attended to, will yield every year during the continuance of the foreſt, ſeven pounds worth of ſugar; allow one half for the labour and proviſions, then the intereſt of £. 50 is left for real value of the lands or trees, becauſe they will always with attention pay the intereſt of that ſum, which is much greater than can poſſibly be afforded for any lands to be made uſe of on the principles of the preſent mode of farming. And if ſuch advantages as I have pointed out will reſult from the manufactory adviſed, what may we not look forward to when the minds of men are become ſo liberal as to view liberty in its true light—when ſlavery ſhall be done away. To this day the preſent generation look, and the ſucceeding one will no doubt put it in practice; then the Weſt-India planter muſt prepare more expenſive proviſions for his labourers, not to mention wages and other expences which conſequently attend the hireling. Common ſenſe leads us to ſuppoſe that ſugar muſt continually riſe in that quarter.

How much blood and treaſure has been expended in protecting the ſugar plantations of the Weſt-India iſlands, and kings and parliaments deeply intereſted in the event? whilſt we here without exerciſing the laſh of cruelty on our fellow creatures! without cultivation from year to year, have theſe ſo much ſought for excellencies plentifully given to us by the bountiful hand of nature, and whilſt they are ſpending their wealth to protect,

we are ſpending ours to deſtroy. Therefore, how neceſſary is it that public bodies ſhould interfere to reſcue from deſtruction theſe trees; theſe diamonds of America; theſe gifts of Heaven, which never created any thing in vain. Thouſands of them are daily deſtroyed, a mode to prevent which is well worthy the ſerious conſideration of this ſociety. I ſtand alone for their protection, and plainly perceive that our country will ſoon be deprived of them; but knowing their value, I now plead their cauſe.

# OBSERVATIONS

ON THE

# *HESSIAN FLY.*

By JONATHAN N. HAVENS, Esquire.

THE inſect, now univerſally known by the name of the Heſſian Fly, was firſt perceived on Shelter-Iſland, and the adjacent parts of Long-Iſland as far eaſtward as that iſland, a little before the harveſt of the year eighty ſix, and appeared to have come from the weſt end of Long-Iſland, in a gradual progreſs of between twenty and thirty miles in a year. Before the harveſt in this ſeaſon, the ſpecies appeared to be few in number, but in the fall next following it was found to have greatly encreaſed, and appeared in great numbers on the green wheat, and was obſerved to do moſt injury to that which had been moſt early ſown. At this time the nature of the inſect and its various transformations were very little underſtood by people in that part of the country. It was currently reported in the winter following, that the fly was to be found in great numbers in the wheat in ſheaf; from whence it was concluded that it muſt neceſſarily have ſome immediate dependence upon the wheat in grain, either for food, or in ſome other manner for the preſervation of its ſpecies. This opinion was ſuppoſed

to be confirmed by the appearance of a ſmall quantity of bran which would fall out of many ſheaves of wheat when they were ſhaken; but notwithſtanding this appearance, it was ſufficiently evident, upon a more careful examination, that this opinion muſt neceſſarily be erroneous; and that this inſect, which was affirmed to be the Heſſian Fly, could have no relation to that which was found to be ſo injurious to the wheat when growing in the field. Repeated obſervations were made at that time by a gentleman of Shelter-Iſland and myſelf, to aſcertain the fact, whether there was any connection between theſe two ſpecies of inſects, and whether the inſect which was upon the wheat in ſheaf did in reality any miſchief to the grain. When the ſheaves of wheat were ſhaken, there fell out a ſmall white inſect which very much reſembled the one commonly called a book-louſe; this as it grew larger appeared gradually to turn of a brown colour, and to have wings, but not to undergo any regular transformation like many other ſpecies of inſects; and at laſt it appeared to become a ſmall black fly. There was no other ſpecies except this which could be imagined to be the Heſſian Fly, and this did not appear to derive any nouriſhment from the grain; it was moſt probable that it was ſome kind of inſect which was brought in with the wheat from the field, and only harbored during the winter ſeaſon in the ſtraw, and might perhaps have been eaſily diſcovered before if the wheat had been examined. The appearance of bran, which fell from the ſheaves, we ſuppoſed ought rather to be accounted for, as

proceeding from mice or weavels, or ſome other cauſe of the like nature. It will be impoſſible in an account intended to be ſo conciſe as the preſent, to relate every minute particular; it was, however, ſufficiently obvious, both from the ſhape of this ſpecies of inſect, and from every other attending circumſtance, that it could have no connection with the inſect which had been found on the wheat in the field, and this opinion was abundantly confirmed by ſucceeding obſervations. In the ſpring of the year eighty-ſeven, the inſect in the field, and which proved to be the real Heſſian Fly, multiplied ſo extremely faſt on the green wheat, that at the enſuing harveſt many fields were almoſt wholly deſtroyed; and in the fall of that ſeaſon, the wheat then growing ſuffered as great injury as wheat had done before in the ſpring; and the harveſt next enſuing, which was in the year eighty-eight, was cut off almoſt univerſally. The kinds of wheat then moſt generally in uſe among farmers in that part of the country, were the red bald, and the ſpring or ſummer wheat; both of theſe were equally affected: Rye, the leſs affected in general, was in many places much injured; and what appeared moſt ſingular was, that a piece of ſummer barley, belonging to the gentleman before alluded to, was about that time wholly cut off. After ſo general a deſtruction of wheat for two ſucceſſive harveſts, farmers began to turn their attention to raiſing rye, and that kind of grain was in general ſown in the fall of the year eighty-eight, except in ſome few inſtances where the bearded wheat had been obtained; and at the enſuing harveſt in the

year eighty-nine, the inſect appeared to be gone. In the fall of the year eighty-nine, the ſeveral ſorts of bearded wheat were pretty generally introduced, and the harveſt next following, which was in the year ninety, was in general very fine, and very few of the inſect were to be ſeen. This ſucceſs, which enſued in conſequence of the introduction of bearded wheat, gave great encouragement to farmers, and induced them to ſuppoſe that the raiſing of that ſort of wheat alone, without any other precaution, would in future prove an effectual remedy againſt the deſtruction occaſioned by the Heſſian Fly, but experience ſoon after diſcovered this to be a miſtake; for notwithſtanding the uſe of that kind of wheat, the fly again encreaſed in the laſt year, ſo as to be found in great numbers in many places, which could be attributed to no other cauſe except this—that the wheat had been ſown ſo early in the fall preceding, as to afford it an opportunity to increaſe. It may not be improper here to remark, that ſowing wheat early in the fall is a circumſtance very neceſſary to be attended to on Long-Iſland, that the wheat may obtain a good growth before the cold weather, and be leſs liable to be injured by the ſevere froſts which frequently happen in the winter ſeaſon when the ground is not covered with ſnow. From this conciſe view of the firſt appearances, increaſe and decline of this ſpecies of inſect in this part of the country, and its revival again in the laſt year, it will appear, that bald and ſummer wheat will continue and multiply the ſpecies until the grain is deſtroyed; that on the contrary, rye and the various

kinds of bearded wheat will ſoon reduce them to an inconſiderable number; but that bearded wheat alone will not have that good effect unleſs it be attended with the circumſtance of being ſown late; and that the idea which has been prevalent in many parts of the country, that there exiſts ſome principle in the nature of the inſect itſelf, which will cauſe it to decline, or wholly diſappear, in any particular place, after it has prevailed there for three ſucceſſive years, is an opinion which experience has ſhewn to be erroneous; and that the better opinion is, however unfavorable it may be to the proſperity of our country, that the changes to which the ſpecies is ſubject with reſpect to number, can only ariſe from unfavorable ſeaſons, or from the want of proper food for ſubſiſtence. When this inſect firſt began to prevail in the manner as above related, I conſidered it as a matter of importance to aſcertain its nature and mode of propagation, and the number of generations it paſſed through in a year, and in the two years above mentioned, in which it proved ſo generally deſtructive to wheat, I made a variety of experiments and obſervations on that ſubject; and from ſome of theſe, I was at firſt inclined to ſuppoſe that there might be three generations of the inſect in a year; but afterwards, upon further examination, it appeared ſufficiently evident that there could be but two; and in this opinion I have been more fully confirmed, ſince I have had an opportunity of making repeated examinations into the nature of the inſect in the laſt year. The reſult of theſe obſervations has been, that the Heſſian Fly is an

inſect which has no dependence upon the wheat in grain, either for food, or as a place in which to depoſit any nit or egg for the preſervation of its ſpecies; but is in the winter ſeaſon a chryſalis, and remains through the whole winter in the field, on the green wheat, without ſuffering any apparent injury from froſt or ſnow, and is transformed into a fly, as ſoon as the weather becomes warm enough in the ſpring. The time when this transformation will begin, appears to depend upon a certain degree of heat in the atmoſphere continued for ſome length of time, and will therefore vary in the ſame climate or part of the country in different years, according as the ſeaſon in the ſpring of the year may be more or leſs forward, and will very probably, for the ſame reaſon, vary much more conſiderably in different climates or parts of the country in the ſame year; but although this transformation appears to be effected by a certain degree of heat, yet it is far from being univerſal in the whole ſpecies at the ſame time, but continues according to the beſt obſervations that I have been able to make about three weeks. This variety in the time of making this transformation in the ſpring of the year, under the ſame circumſtances with reſpect to heat, and in the ſame ſeaſon, can perhaps be accounted for in no other way than by ſuppoſing that it muſt proceed from ſomething peculiar in the conſtitution of the inſect itſelf; for it ſeems not very probable that it ſhould be occaſioned by the different times in which the inſect may have become a chryſalis in the fall next preceding, after it has been under the ſnow, and ſubjected

to froſt during the whole winter. In the year eighty-ſeven, this transformation began about the ſixteenth of April, and ended about the firſt of May; and this I believe may be conſidered as the uſual time of its commencement and continuance on the eaſtern parts of Long-Iſland, and perhaps on thoſe parts of the continent which are adjacent. The fly diſengages itſelf from the wheat by boring a ſmall round hole through the brown caſe in which it is encloſed, and through the leaf of the wheat juſt oppoſite to the place where it is lodged, and this hole may be eaſily diſcovered as long as the ſtubble remains entire. Whenever the fly has been hatched in the houſe, it has always come forth from its brown caſe, wrapt in a thin white ſkin, which it ſoon breaks and is then at liberty, and there is every reaſon to ſuppoſe that the ſame effect is produced in the field. The fly, very ſoon after it comes out, is prepared to ſpread itſelf in the field where it has lain during the winter, or to take its flight to more diſtant places in ſearch of wheat on which to lay its eggs or maggots; and it is at this time that it has an opportunity of going on to ſummer wheat, which would otherwiſe eſcape without being injured. The great variety in the time of its firſt coming out, produces the like variety in the time of its depoſiting the maggot on the wheat, out this I ſuppoſe may be generally placed between the 20th of April and the 10th of May; but this period of time, like the former, muſt neceſſarily be regulated, with reſpect to its commencement and continuance, by the ſeaſon; and may

perhaps be affected by bad weather and unfavorable winds, which may benumb the fly and prevent it from taking its flight. It is ſuppoſed that the fly in its progreſs from one place to another, and on fields of wheat, is inclined to keep in ſmall ſwarms; and this opinion appears probable from this circumſtance, that ſome fields of wheat are frequently much more injured than others which are not far diſtant, and the ſame field is frequently injured in ſmall patches whilſt other parts appear in ſome meaſure to have eſcaped. The maggot is properly the firſt ſtate, or mode of exiſtence, with the inſect; for although it appears, at firſt, to reſemble an egg, yet I am inclined to believe that the fly is viviparous, for I never could diſcover that any transformation took place, from an egg to a maggot. It is always found between the loweſt part of the leaf of the wheat, and the part which forms the main ſtalk or ſtraw, to the latter of which it cloſely adheres; and is generally within the outſide leaf, ſo as to lie as near the root as poſſible; but to this there are ſome few exceptions; for it is ſometimes, though very rarely, to be found a little above the upper joints; but inſtances of its being very far from the root are ſo rare, that I never could find but one or two which lay above the higheſt joint. It reſembles at firſt a very ſmall white nit, and as it grows larger, becomes a ſluggiſh, and almoſt inanimate maggot, of a white colour, and capable of very little perceivable motion. In this ſtate, the proper and moſt natural food of the inſect, is the ſap or juice of that kind of green wheat which has the moſt delicate

ſtraw; next to this may be ranked the ſeveral kinds of wheat whoſe ſtraw is more firm and ſolid, ſuch as the various ſorts of bearded wheat, and the great red bald, or red-chaff wheat; and next to this may be ranked rye; with reſpect to barley, I have not had information from different parts of the country, but from the inſtance above recited, I am inclined to believe, that as a food which is agreeable to the inſect, it ought to be ranked with rye, if not before it. Some have affirmed, that the maggot has been found on oats, but I never could diſcover any on that kind of grain. The manner in which the maggot obtains the ſap, or juice of the grain, appears to be altogether by ſuction, which is very probably performed through ſome very fine and imperceptible tubes. It appears deſtitute of any faculty of corroding the ſolid part of the ſtraw; and as it grows larger its whole body indents the ſtraw, and prevents the riſe of the ſap, and the grain either falls down, or periſhes before it has grown to be of any conſiderable height. The ſize of the maggot when full grown, and the time neceſſary to compleat its growth, depend in a great degree on the quantity of nouriſhment it may obtain from the grain, and the number of maggots that may happen to be on one ſtraw. This, according to the beſt of my obſervations, is ſomewhere between four and ſix weeks, which will bring the time in which its growth will generally be compleated, to be in the firſt part of June. But here the ſeveral cauſes of variety in the time of its being laid in the wheat, and of its compleating its growth, both conſpire to

render this time ſo various, that ſome will be full grown, and others transformed into a chryſalis, whilſt others are ſmall; and this circumſtance has no doubt led many ſkilful obſervers to ſuppoſe, that there are two compleat generations of the inſect before harveſt. From this account of the maggot it will be obvious, that this is the ſtate in which the inſect deſtroys the grain; for as ſoon as it has obtained its growth, it is transformed into a chryſalis of a dark brown colour, in which ſtate it requires no further nouriſhment, and appears then to do no other miſchief to the grain, than what may ariſe from indenting the ſtraw. The chryſalis is the ſecond ſtate, or mode of exiſtence, which the inſect aſſumes, and is that in which it is moſtly obſerved. It is found in this ſtate in the time of harveſt, and when the grain is gathered, remains in the ſtubble until it is transformed into a fly: But to this there are ſome few exceptions; for thoſe which are ſometimes in the upper joints, and may happen to be ſo high as to be above the ſickle or cradle when the grain is gathered, will of courſe be gathered with it, and muſt always go with the ſtraw, becauſe they adhere too cloſely to it, to be beaten, or threſhed off, without being deſtroyed. The length of time for which the inſect will continue a chryſalis in the ſummer ſeaſon, is no doubt regulated in a great degree by the quantum of heat which it may enjoy in that ſituation. For this reaſon it is very probable, that in different parts of the country, and in different expoſures to the ſun, this period of time may vary very conſiderably; but though different

degrees of heat may produce this effect, yet this muſt be underſtood to be within certain limits; for the chryſalis can endure but a very ſmall degree of heat beyond that which is uſual in its natural ſituation in the field. Beſides theſe effects proceeding from heat, I am inclined, for ſeveral reaſons, to ſuppoſe that different degrees of moiſture will produce effects of a ſimilar nature. 1. Becauſe the chryſalis will periſh, when expoſed to the rays of the ſun, in ſuch manner as to become very dry, and have all its natural moiſture exhaled. 2. Becauſe the fly when hatched in the houſe, where the chryſalis has been kept more dry than in the open air, will always come forth very feeble and will never acquire that life and activity which it muſt be ſuppoſed to have in the field. 3. Becauſe there is reaſon to believe, that too great a degree of moiſture, will in this caſe, produce effects ſimilar to thoſe which muſt ariſe from too ſmall a degree of heat. Although it will prove fatal to the chryſalis, to be expoſed to any great degree of heat, beyond that which is uſual in the open air in the ſummer ſeaſon, yet cold and wet, even in the greateſt extremes ever known in our climate in the winter ſeaſon, appear to affect it no otherwiſe, than to continue it in the ſame ſtate, and prevent its transformation into a fly, until it can again enjoy that degree of heat and moiſture which is moſt agreeable to its conſtitution. Theſe circumſtances render it difficult to aſcertain with preciſion, the length of time that the inſect will continue a chryſalis during the ſummer ſeaſon. But from the beſt obſervations I have been able to make, it is

not leſs than two months, and may be prolonged to a much longer time by any of the cauſes before mentioned. All theſe ſeveral cauſes of variety in the time of its continuing in this ſtate, together with the various times in which it is firſt formed into a chryſalis in the month of June, conſpire to render the period of time in which it makes its next transformation into a fly, much longer than any of the other periods of time in which the inſect makes its ſeveral transformations. It generally begins about the 20th or 25th of Auguſt, and continues in a greater or leſs degree through the whole month of September, but by far the greater part of the ſpecies are without doubt transformed into a fly, in the firſt part of this latter month. This appears ſufficiently evident from this conſideration, that wheat, ſown early enough in the ſeaſon to be up in the firſt week in September, will generally be deſtroyed; and on the contrary when it is ſown ſo late as not to be up until ſome time in October, it will in great meaſure eſcape. I have ſuppoſed this transformation to take place, between the 20th of Auguſt and the firſt of October, but this ought no doubt to be underſtood with ſome exceptions; for it is very probable that in ſome few inſtances, and in ſome particular ſituations with reſpect to heat and moiſture, it may begin ſomewhat ſooner; and on the contrary, if the weather ſhould prove moderate in the month of October, there is no reaſon to doubt but that it may continue in ſome degree through the greater part of that month. A reflection will here naturally ariſe from the fore-

going account, that nature appears to have fixt this transformation to commence with, and continue through the whole of that ſeaſon of the year, which is moſt proper for ſowing wheat. ——The fly is the third and laſt ſtate of the inſect, and compleats what I have here termed one generation. It very much reſembles the moſchetto, except that it is much ſmaller and has a ſhort bill. I never could diſcover that it preyed upon the wheat, and very probable it requires no other nouriſhment than what it may obtain from dew or moiſture. It is of a texture ſo delicate, as to be injured or deſtroyed by the ſlighteſt accident. Soon after it becomes a fly, it again lays the maggot on the wheat ſown in the fall; and if this is not up at the particular time the fly requires it, the maggot muſt be in great meaſure loſt, and the ſpecies reduced to a ſmall number. It is difficult to diſcover for what length of time the inſect will continue a fly in its natural ſituation in the field: in all inſtances where it has been hatched under cover, or in glaſſes provided for that purpoſe, it has ſoon periſhed; and if we may reaſon by way of analogy from the caſe of other inſects, there is little reaſon to doubt, but that the time of its continuance muſt be very ſhort. The maggot generally proves more deſtructive to wheat in the fall of the year than in the ſpring; and before cold weather is transformed into a chryſalis, in which ſtate it is prepared to remain during the winter, and in the ſpring will again be transformed into a fly; which compleats two generations of the inſect in one year.

It may not be improper here to mention ſome few experiments and obſervations which I have made on this ſubject; all of which appear to confirm the foregoing opinion reſpecting the number of generations which this inſect paſſes through in a year. A number of the chryſalis gathered from the wheat, about the middle of laſt June, were kept in the houſe in glaſſes, and in a ſituation where they were not expoſed to the rays of the ſun, and a part of thoſe were transformed into a fly between the 10th and the 13th of September; and a number of others gathered from the ſtubble after harveſt, and placed in the ſame ſituation, became a fly about the ſame time. The remainder of thoſe, which were not transformed into a fly at that time, continued in the ſame ſtate until the weather became too cold for them to make their transformation. In the year eighty-ſeven, I made experiments of a ſimilar nature, with only this difference, that the chryſalis was expoſed to the rays of the ſun in ſuch manner that the heat would not be too violent, and in this caſe, a few of them were transformed into a fly, as early as the middle of Auguſt. It muſt however be obſerved, that in all experiments made in this manner, there is reaſon to ſuppoſe ſome degree of uncertainty, becauſe the chryſalis is removed from its natural ſituation: for this reaſon I have always ſuppoſed, that the beſt method to arrive at truth on this ſubject, is to examine the progreſs of the inſect in the field; and with this view I examined the ſtubble of a field of wheat, where great numbers of the inſect were to be found, as often as

twice in a week, from the firſt of September until the 14th of November in the laſt fall, and found them continually to diminiſh in number, but that there were ſtill ſome few of the chryſalis remaining. Theſe I have ſuppoſed muſt either be conſidered as ſome few which were anomalous, and never intended by nature to undergo any transformation; or elſe it muſt be concluded, that many of thoſe which become a chryſalis late in the month of June, will remain in that ſtate for ſo long a time, that the weather will become too cold for them to be transformed into a fly in the fall, and then they muſt neceſſarily continue in that ſtate through the winter, until it becomes warm enough in the ſpring: and if this latter concluſion be conſiſtent with truth, it will follow, that ſo far as reſpects theſe, there can be only one generation in a year. It is an opinion entertained by many, that there are three generations of this inſect in a year; but in anſwer to this, I ſhall only obſerve, that independent of what has been before ſaid on this ſubject, this opinion muſt appear improbable from this conſideration—that if we ſuppoſe three generations in a year, it will follow, that the inſect will be twice a fly before harveſt, and the ſecond time of its being a fly muſt happen when the wheat is in the milk or very near it; at which time it is ſo large and rank, and ſo ſoon after changes its colour and becomes dry, that the maggot which muſt then be laid in it, would not have ſufficient time to compleat its growth, and would therefore periſh, and in the fall of the year the inſect would diſappear. Others are of opinion, that there is ſo

great a variety in the transformations of this inſect, that it may be found in all its different ſtates, at all times in the year, excepting in the cold weather, or in the ſpring. From what has been before obſerved on this ſubject, it appears, that this opinion may very probably be true, ſo far as it reſpects the month of September, and a part of October, and poſſibly with reſpect to the latter part of May, if the fly, which is hatched in the ſpring, ſhould continue until that time; but cannot be applied with propriety to June and July, in which months I have ſuppoſed that the inſect does not exiſt in the ſtate of a fly. It is probable that this opinion may have ariſen from theſe circumſtances; that there are ſeveral ſpecies of gnats, or flies, which may very eaſily be miſtaken for the Heſſian fly; and that in examining wheat, to diſcover whether the inſect is transformed into a fly, it is very difficult to diſtinguiſh the ſhells of the chryſalis which has lain in the wheat during the winter, from thoſe of the next generation which has ſucceeded them in the ſpring and ſummer following; and this latter circumſtance, without great care, will be a ſource of perpetual miſtake and error to thoſe who may examine into the nature of the inſect, and is perhaps one of the greateſt obſtacles to arriving at certainty on this ſubject.

Of all the various methods which have been propoſed to the public, for preventing the injurious effects of this inſect, that of raiſing the different ſorts of bearded wheat has beſt ſucceeded. This kind of wheat having a more ſolid ſtraw than

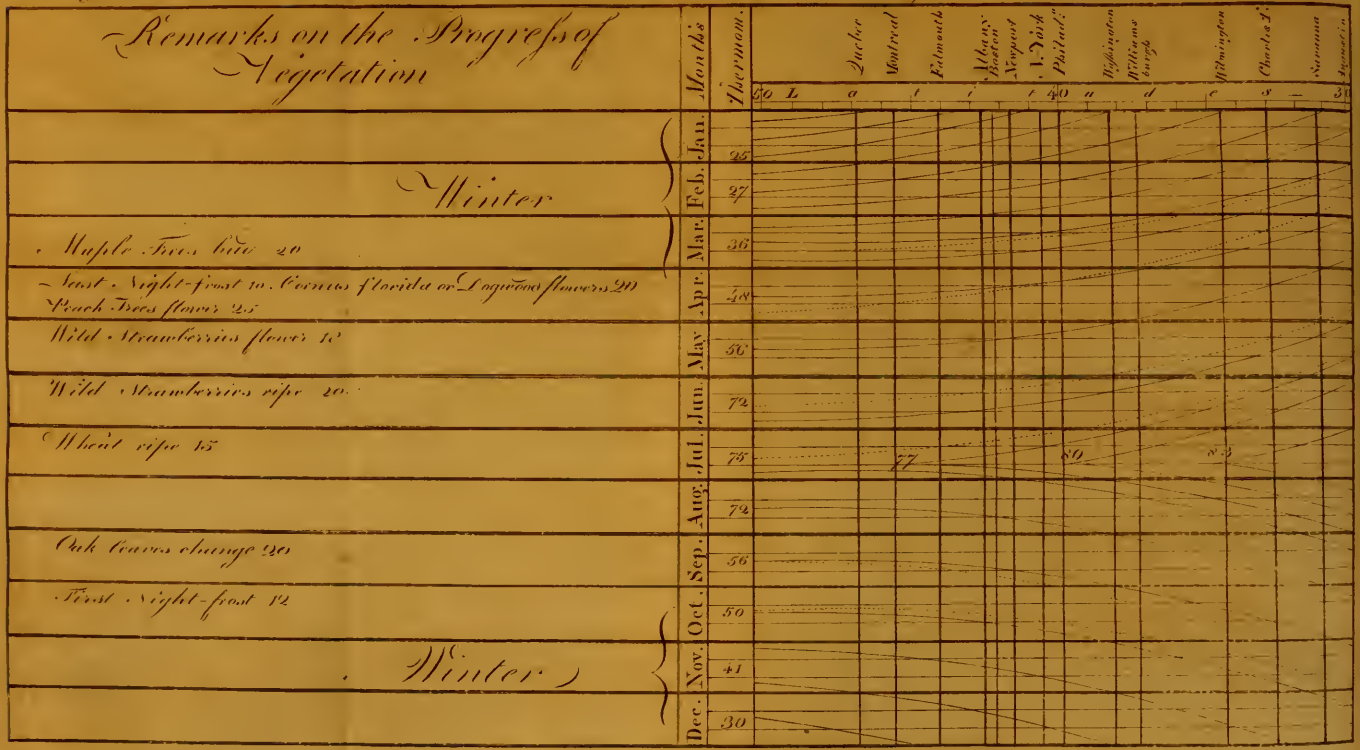
the bald wheat, reſiſts the impreſſion made by the body of the inſect, and in great meaſure prevents the injury which ariſes from preventing the riſe of the ſap; and for the ſame reaſon is very probably more diſagreeable to the conſtitution of the inſect. During the laſt year, I had an opportunity of making one fair experiment, to determine whether any preference ought to be given to any one of the different ſorts of wheat, whoſe ſtraw is more firm and ſolid than the bald wheat. I ſowed three different ſorts of wheat, adjoining to each other, and all at the ſame time; the white bearded, the yellow bearded, and the great red-chaff wheat, whoſe ſtraw is equally hard with that of the bearded wheat; of theſe three ſorts, the red-chaff was by far the moſt injured; and the yellow bearded which lay adjoining to it, leaſt of all.

I SHALL now take the liberty of ſuggeſting a method of deſtroying the inſect, which naturally occurred to my mind, on obſerving that it is not to be found in any other ſtate than that of a chryſalis in the time of harveſt, and that it remains in that ſtate in the ſtubble for ſome time afterward; and that is, *to deſtroy the ſtubble of grain ſoon after harveſt.* Whether this would be beſt effected by burning or otherwiſe, and whether the grain in this caſe ought not to be cut with the ſickle rather than mowed or cradled, and whether the coſts that would attend it would not overbalance the advantage, are points to be taken into conſideration in determining whether any thing of this kind would be feaſible, and which I ſhall not now pretend to diſcuſs;

but if the ſtubble of wheat were to be univerſally burnt, turned over with the plough, or deſtroyed in any other manner, ſoon after harveſt, and this were to be done for ſeveral years together, I have little doubt but that it would prove an effectual mean of deſtroying the whole ſpecies: I here mention only the ſtubble of wheat, becauſe it is not very probable that the ſpecies would be continued long on rye, more eſpecially as that can be ſown much later than wheat, without injury from the winter; but the ſtubble of rye might, if neceſſary, be as eaſily deſtroyed as that of wheat; and if in aid of this the beſt ſort of bearded wheat were to be uſed, and that to be ſown as late as poſſible conſiſtent with a good crop, it would be ſtill more likely to ſucceed. With reſpect to the probability of their being imported from any foreign country, I ſhall make only one remark, that from the foregoing account it appears evident, that they may be removed from their natural ſituation in the field, and be kept alive long enough to be carried acroſs the Atlantic; from which circumſtance it appears poſſible that they might have been imported in ſtraw or ſtubble. It has been generally remarked that in ſpreading over the country they go between twenty and thirty miles in a year; but as they are a fly twice in the ſame ſeaſon, it appears probable, that the fly itſelf never goes much farther than twelve or fifteen miles. Before this ſubject is concluded, it ought to be remarked, that the truth of what has been here ſaid concerning the nature of this inſect, and the ſeveral generations through which is paſſes

in a year, does not entirely reſt on my own particular experiments and obſervations, but has been corroborated by the obſervations and experiments of the gentleman, to whom I have before alluded in treating on this ſubject. How far this account may have been confirmed, or contradicted by others who may have obſerved the various phenomena of the inſect, I am not able to ſay; but if it ſhould appear upon further inveſtigation, that what has been here advanced is erroneous, it ought to give me and every other lover of truth, great pleaſure to ſtand corrected, on a ſubject of ſo much importance to the public.—It has been before obſerved, that the ſureſt way of arriving at truth on this ſubject, is to examine the progreſs of the inſect in the field; and to carry this into effect, I would ſuggeſt the following method:—Let thoſe who may have leiſure and curioſity on this ſubject, and who may reſide in different parts of the country where the inſect may prevail, ſow ſmall patches of different kinds of wheat, as often as once or twice in a month, during the whole ſeaſon, adjoining to ſome field of wheat or ſtubble, where the inſect may be found in greateſt number; and let the progreſs of the inſect be obſerved on thoſe different patches of wheat; and let the reſult of theſe obſervations be collected and compared with each other; this, if it could be carried into effect, I have conceived would be the ſureſt method of arriving at certainty on this ſubject, and perhaps ſomething not now thought of might be diſcovered, which would prove an effectual remedy againſt the injurious effects of this inſect.

PLAN of A METEOROLOGICAL CHART for exhibiting a comparative view of the Climates of NORTH AMERICA and the progress of Vegetation. by Simeon De Witt M.A.P.S.



*Reſpecting a* Plan *of a* Meteorological Chart, *for exhibiting a comparative view of the* Climates *of* North America, *and the progreſs of* Vegetation, *by* SIMEON DE WITT, M. A. P. S.

IT will not be denied that it is a deſideratum, of no ſmall moment, in practical Agriculture, to be enabled to aſcertain, with as much preciſion as the nature of the caſe will admit, the relative degrees of heat and cold, and of the progreſs of vegetation, through the ſeaſons, in the various climates of America, and ſo to arrange them, as that they may be obſerved in the readieſt manner. Without adducing any other reaſon, a ſingle reflection will convince one of its utility; for, as the ſtate of vegetation is very different in different climates at the ſame time, without knowing what allowances are to be made on this account, the farmer, in one climate, will not be able properly to apply to his practice the experiments on huſbandry made in another; and unleſs the reſult of the obſervations, from which this knowledge is to be deduced, be conveniently arranged, one will be neceſſitated to rumage through a confuſed heap of meteorological tables, collected from various quarters for a ſucceſſion of years; a buſineſs too difficult to prove generally beneficial. It is in ſome meaſure owing to this cauſe, that we profit ſo little by books of huſbandry written in Europe.

To obviate theſe inconveniencies is the deſign of the plan which I have the honor of preſenting. The requiſites for

conſtructing it will be, beſides the common obſervations on the weather, obſervations on the annual commencement, progreſs, maturity and decay of vegetation, made in various parts, for a number of years; the averages whereof may be taken for ſtandards by which to exhibit a compariſon of climates.

To effect this deſign, I would propoſe that the different ſocieties on the continent, which compriſe agriculture among the objects of their inſtitution, be requeſted to co-operate.

The remarks on vegetation ſhould commence with the firſt appearance of it in the ſpring, and be made on graſs in general, the budding of trees, the flowering of plants, the maturity of the ſeveral kinds of winter grain and fruit, and the falling of leaves, and other ſymptoms of decay, in the fall.—In theſe obſervations a preference ſhould be given to thoſe vegetables which are of the moſt valuable kind, and to others which are known to be common to all the places where the obſervations are made. Cultivated annuals, the ſeeds of which are planted or ſown in the ſpring, ſhould be entirely omitted, as their forwardneſs depends principally on the degree of care beſtowed upon them. In general the Linnean, as well as the vulgar names ſhould be given, ſince the latter are well known to differ in many inſtances, even in States adjoining each other, and therefore might lead into error. After a ſufficient courſe of obſervations is completed ſuch vegetables, as will beſt anſwer

the purpoſes intended, may be ſelected for the meteorological chart.

A MEAN between the extremes of heat and cold within the twenty-four hours, which I think will be beſt determined by the ſtate of the thermometer at or before ſunriſe, and the middle of the afternoon, ſhould be taken for the temperature of the weather. Perhaps it would not be amiſs, alſo to note the firſt appearance and diſappearance of birds of paſſage, particularly the ſwallow, as a criterion by which to judge of the advanced ſtate of the ſeaſons.

## Explanation *of the* CHART.

AT the head of the chart, on the right hand ſide, are to be the names of the places, where the obſervations are made, oppoſite to their reſpective latitudes, expreſſed on the graduated ſcale immediately below them; from each place, a line is drawn perpendicularly downwards. The large ſpace on the left, is for the remarks on vegetation, oppoſite to the ſeveral months in which they occur. The next column is divided into months, and its ſubdviſions, carried by ſtraight lines horizontally acroſs the chart. In the next column the mean degrees of heat, taken from Farenheit's thermometer, are to be inſerted for every ten days throughout the year; from each of which, curve lines are to be drawn, in ſuch a manner, as to interſect the perpendicular lines of the ſeveral places oppoſite to thoſe times reſpectively, in the

column of months, of which they are of the ſame temperature. Perhaps it would be of uſe to have three columns, inſtead of one, for the thermometer; one to receive the mean of the morning obſervations, the other the mean of the afternoon obſervations, and the third the mean of the two others. In the ſame manner, dotted lines are to be drawn, to ſhew at what times any of the phenomena of vegetation occur at different places. The neceſſity of this diſtinction ariſes from the circumſtance, that the thermometer and vegetation do not exactly keep pace with each other.

FARTHER to illuſtrate the uſe of this chart, let it be required to find what time at Williamſburgh correſponds in temperature with the firſt of May at New-York. In the perpendicular line of New-York, take that point which is oppoſite to the firſt of May, and from thence, follow the direction of the *black* curve lines, till you interſect the line of Williamſburgh, and the place in the column of months to which you are oppoſite, will expreſs the required time. Again, let it be required to find when wheat is ripe at Williamſburgh—In the column of remarks ſee the figure, annexed to that remark, which expreſſes the day of the oppoſite month; and from that part of the month, follow the direction of the *dotted* lines, till you interſect the line of Williamſburgh, and the time will be ſhewn in the column of month oppoſite to it.

IT is a fact well known, that the weſtern parts of this country do not correſpond in climate, with thoſe lying in the ſame

latitude along the ſea coaſt. If, therefore, ſuch a chart be conſtructed, from obſervations made in places near the Atlantic, correſpondent obſervations made in the interior parts of the country, will enable us to aſcertain to what latitude in the chart they are to be referred.

If a diſtinct chart were conſtructed, on the ſame plan, for the principal places in Europe, one might with equal facility, by the help of both charts, compare their climates with thoſe of America.

It is to be obſerved, that the plan which I have produced, muſt be conſidered as a mere deſign, as I have but lately taken up the idea, and have no materials at preſent before me, from which I might make an attempt to come any way near to the truth; but I truſt it is repreſented ſufficiently plain to ſhew its nature and uſe, and that the advantages of it will, at firſt view, appear of ſuch importance, as to engage ſcientific gentlemen to collect and contribute materials for perfecting it.

| | Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8, A.M. | 2, P.M. | 3, P.M. | January, 1790. WEATHER, &c. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 37 | 42 | 35 | W | | | clear |
| | 2 | 37 | 42 | 38 | S.W. | | | clear |
| C | 3 | 36 | 45 | 41 | S.W. | | | clear |
| | 4 | 42 | 54 | 44 | S.W. | | N. | clear cloudy |
| | 5 | 35 | 30 | 25 | N. | N W | | cloudy clear |
| | 6 | 20 | 24 | 27 | N W | S.W. | S. | clear cloudy |
| | 7 | 35 | 42 | 37 | S.W. | | W. | cloudy clear |
| | 8 | 34 | 37 | 38 | S.W. | S. | S.W. | cloudy |
| | 9 | 34 | 37 | 34 | N W | W. | | cloudy clear |
| C | 10 | 24 | 26 | 24 | N W | | | clear |
| | 11 | 23 | 36 | 34 | S.W. | S. | S.W. | cloudy lt. sn. rain & sn. |
| | 12 | 32 | 33 | 30 | W. | | N W | clear |
| | 13 | 27 | 33 | 36 | N.E. | E. | | cloudy dull rain |
| | 14 | 35 | 40 | 37 | S.W. | | | cloudy clear |
| | 15 | 35 | 36 | 33 | N.E. | | | cloudy hard sn. cloudy |
| | 16 | 35 | 37 | 38 | N. | S.W. | | rain dull |
| C | 17 | 35 | 38 | 35 | N. | S.W. | | dull clear |
| | 18 | 31 | 37 | 37 | N. | S. E. | | clear cloudy |
| | 19 | 30 | 41 | 40 | S. E. | | S. | foggy dull rain |
| | 20 | 23 | 25 | 28 | N W | | W. | clear |
| | 21 | 21 | 24 | 27 | N W | W. | | clear |
| | 22 | 25 | 37 | 37 | W. | | | clear |
| | 23 | 32 | 36 | 35 | S.W. | | | clear cloudy |
| C | 24 | 33 | 35 | 33 | N.E. | | | dull fleet snow |
| | 25 | 25 | 31 | 29 | N W | | | clear |
| | 26 | 26 | 36 | 39 | N. | S. | | cloudy |
| | 27 | 37 | 34 | 31 | N W | | | fleet snow cloudy |
| | 28 | 24 | 30 | 30 | N W | S. | N W | foggy dull clear |
| | 29 | 25 | 29 | 28 | S.W. | | | clear |
| | 30 | 28 | 34 | 28 | S.W. | | | clear cloudy clear |
| C | 31 | 26 | 34 | 32 | N W | S.W. | | clear |

| | Day. | HEAT. 8 o'cl. P. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8, A.M. | 2, P.M. | 3, P.M. | February, 1790. WEATHER, &c. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 33 | 37 | 38 | N.E. | | S.W. | cloudy |
| | 2 | 30 | 33 | 30 | N W | N. | | cloudy clear |
| | 3 | 17 | 25 | 25 | N W | | N W | clear |
| | 4 | 29 | 35 | 34 | N.E. | | S.W. | rain cloudy |
| | 5 | 27 | 31 | 22 | W. | | N W | clear and wind high |
| | 6 | 16 | 19 | 19 | N W | | | clear |
| C | 7 | 20 | 29 | 32 | SSW | | | cloudy dull cloudy |
| | 8 | 33 | 29 | 22 | N W | | | clear |
| | 9 | 15 | 18 | 16 | N W | | | cloudy clear |
| | 10 | 9 | 14 | 13 | N W | | W. | clear |
| | 11 | 12 | 19 | 13 | W. | | NW | clear |
| | 12 | 13 | 18 | 18 | N W | | | clear |
| | 13 | 12 | 21 | 21 | N W | S.W. | | clear |
| C | 14 | 21 | 26 | 26 | S. | | W. | snow dull cloudy |
| | 15 | 29 | 38 | 36 | S.W. | | S. | clear rain |
| | 16 | 36 | 42 | 38 | S.W. | W. | N.E. | dull wet rain |
| C | 17 | 36 | 38 | 36 | N. | N.E. | N. | rain wet dull |
| | 18 | 35 | 38 | 35 | S.W. | | S. | dull cloudy |
| | 19 | 36 | 45 | 42 | N W | | | clear cloudy |
| | 20 | 39 | 40 | 36 | N.E. | | | cloudy dull rain |
| C | 21 | 34 | 36 | 34 | N.E. | | | dull |
| | 22 | 35 | 36 | 36 | N.E. | | | dull hazy |
| | 23 | 36 | 36 | 36 | N.E. | | | hazy fleet wet |
| | 24 | 36 | 37 | 45 | N.E. | | W. | wet dull |
| | 25 | 39 | 42 | 37 | W. | N W | | cloudy clear |
| | 26 | 34 | 42 | 38 | W. | S.W. | W. | cloudy clear |
| | 27 | 37 | 42 | 40 | W. | | | clear |
| C | 28 | 34 | 46 | 42 | S.W. | | N W | clear |

| | HEAT. | | | WIND. | | | March, 1790. |
|---|---|---|---|---|---|---|---|
| Day. | 8 o'cl. A. M. | 2 o'cl. A. M. | 8 o'cl. A. M. | 8, A.M. | 2, P.M. | 8, A.M. | WEATHER, &c. |
| 1 | 29 | 36 | 36 | N.E. | E. | S. E. | clear cloudy rain |
| 2 | 36 | 42 | 42 | N W | S.W. | | dull clear |
| 3 | 44 | 36 | 24 | W | N W | | clear |
| 4 | 17 | 25 | 24 | N W | | | clear |
| 5 | 23 | 32 | 36 | W. | S.W. | S. E. | clear cloudy |
| 6 | 41 | 51 | 38 | S. E. | S.W. | | rain cloudy clear |
| C 7 | 38 | 42 | 37 | W | | S.W. | clear cloudy |
| 8 | 22 | 27 | 20 | N W | S.W. | N W | clear cloudy |
| 9 | 6 | 18 | 20 | N W | W. | N W | clear |
| 10 | 18 | 20 | 25 | N W | W. | S.W. | cloudy deep snow |
| 11 | 32 | 32 | 32 | N.E. | N.E. | W. | snow dull clear |
| 12 | 30 | 36 | 34 | N W | W. | S.W. | clear |
| 13 | 34 | 40 | 35 | S. | S. | W. | dull clear |
| C 14 | 36 | 41 | 37 | S.W. | | | cloudy rain clear |
| 15 | 35 | 44 | 41 | N W | | W. | clear |
| 16 | 35 | 38 | 39 | E. | S. E. | | cloudy dull rain |
| 17 | 39 | 55 | 51 | S. E. | S.W. | S.W. | cloudy dull |
| 18 | 44 | 43 | 33 | N W | N. | N W | cloudy clear |
| 19 | 28 | 35 | 39 | N W | | S. E. | clear |
| 20 | 36 | 40 | 38 | S. E. | | S. | cloudy clear |
| C 21 | 40 | 54 | 46 | S.W. | | | dull clear |
| 22 | 45 | 55 | 42 | N.E. | N. | N.E. | clear dull |
| 23 | 40 | 45 | 40 | N.E. | N. | E. | dull cloudy |
| 24 | 39 | 40 | 38 | N.E. | N.E. | E. | dull drizzling rain |
| 25 | 40 | 51 | 43 | E. | S. | S. | clear |
| 26 | 43 | 43 | 40 | N.E. | | | rain drizzling |
| 27 | 41 | 47 | 51 | N.E. | | S. E. | dull cloudy clear |
| C 28 | 45 | 50 | 46 | W. | | S.W. | clear cloudy clear |
| 29 | 40 | 45 | 41 | N.E. | N.E. | S. E. | clear cloudy clear |
| 30 | 36 | 45 | 40 | N W | | | clear |
| 31 | 35 | 45 | 40 | N W | S. | | clear |

| | HEAT. | | | WIND. | | | April, 1790. |
|---|---|---|---|---|---|---|---|
| Day. | 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | 8, A.M. | 2, P.M. | 8, A.M. | WEATHER, &c. |
| 1 | 40 | 45 | 44 | S. | | | clear |
| 2 | 45 | 46 | 45 | S. E. | | | dull rain |
| 3 | 48 | 55 | 53 | N W | | | clear |
| C 4 | 52 | 65 | 60 | S.W. | S. | | clear |
| 5 | 54 | 65 | 52 | N W | N.E. | S. | clear |
| 6 | 45 | 46 | 43 | E. | | N. | rain |
| 7 | 33 | 40 | 37 | N W | | | clear |
| 8 | 38 | 43 | 41 | S.W. | | S. | dull rain |
| 9 | 43 | 55 | 42 | N.E. | S. | | clear |
| 10 | 50 | 52 | 52 | S. E. | | | clear cloudy rain |
| C 11 | 45 | 51 | 48 | N. | | N W | cloudy clear |
| 12 | 46 | 61 | 52 | N W | | | clear |
| 13 | 43 | 57 | 51 | N W | S. E. | | clear |
| 14 | 44 | 48 | 41 | N W | S. E. | | clear cloudy rain |
| 15 | 42 | 48 | 40 | N. | N.E. | | cloudy dull drizzling |
| 16 | 38 | 50 | 42 | N. | N.E. | S. E. | clear |
| 17 | 39 | 45 | 40 | N. | N.E. | E. | clear cloudy cloudy |
| C 18 | 34 | 42 | 40 | N.E. | | E. | snow rain & heavy gale |
| 19 | 38 | 44 | 40 | W. | | N W | dull cloudy clear |
| 20 | 40 | 42 | 38 | N.E. | | E. | cloudy rain heavy |
| 21 | 44 | 55 | 47 | W. | | | clear [gale & rain |
| 22 | 46 | 53 | 50 | S.W. | | W. | clear |
| 23 | 46 | 56 | 51 | N W | | | clear cloudy clear |
| 24 | 48 | 49 | 50 | N W | | | clear |
| C 25 | 42 | 45 | 44 | N.E. | | | clear |
| 26 | 42 | 50 | 48 | N W | S. | | cloudy |
| 27 | 36 | 40 | 38 | N W | N. | | cloudy clear |
| 28 | 34 | 40 | 40 | N. | N W | W. | snow dull rain |
| 29 | 40 | 45 | 45 | W. | S.W. | S. | snow cloudy |
| 30 | 38 | 45 | 40 | N W | | | clear squally cloudy |

*May*, 1790.

| | Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8, A.M. | 2, P.M. | 8, P.M. | WEATHER, &c. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 45 | 60 | 55 | N W | S. | | clear |
| C | 2 | 49 | 62 | 55 | S. E. | | S. | clear cloudy |
| | 3 | 55 | 68 | 64 | S. | | | cloudy clear |
| | 4 | 58 | 60 | 58 | N W | | S.W. | cloudy |
| | 5 | 52 | 56 | 53 | E. | | | dull |
| | 6 | 51 | 57 | 51 | N.E. | | | dull cloudy dull |
| | 7 | 46 | 56 | 53 | N W | N. | S. | clear |
| | 8 | 50 | 55 | 55 | S. E. | | S. | clear |
| C | 9 | 53 | 57 | 55 | S. E. | S. | | clear |
| | 10 | 55 | 68 | 66 | S. | S.W. | | clear |
| | 11 | 61 | 63 | 60 | N. | S.E. | N. | clear |
| | 12 | 58 | 73 | 65 | S. | | N.E. | clear |
| | 13 | 58 | 65 | 62 | N W | S. | N.E. | clear cloudy clear |
| | 14 | 55 | 66 | 63 | N W | N. | | clear |
| | 15 | 55 | 62 | 60 | N W | | | clear |
| C | 16 | 58 | 66 | 60 | N W | S. | | clear |
| | 17 | 58 | 60 | 58 | N. | S. E. | | clear |
| | 18 | 56 | 63 | 58 | N W | | | clear |
| | 19 | 55 | 63 | 59 | N. | S.E | | clear cloudy |
| | 20 | 58 | 58 | 58 | S. E. | | N.E | rain dull |
| | 21 | 58 | 65 | 64 | N. | | S. | cloudy clear |
| | 22 | 58 | 65 | 63 | N W | | | clear |
| C | 23 | 62 | 72 | 63 | N W | | | clear |
| | 24 | 62 | 74 | 68 | S. | W. | | clear |
| | 25 | 59 | 66 | 62 | N.E. | S.E | | dull clear [nt. |
| | 26 | 58 | 67 | 64 | S. E. | | S. | cld'y. cl.r'n. th'dr. at |
| | 27 | 62 | 65 | 60 | N.E. | | | dull rain dull |
| | 28 | 56 | 62 | 57 | N.E. | | S. | dull clear |
| | 29 | 56 | 60 | 59 | W. | S. E. | | clear dull |
| C | 30 | 57 | 63 | 58 | S. E. | | | dull |
| | 31 | 60 | 70 | 55 | S.W. | | | drizzling clear |

*June*, 1790.

| | Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8, A.M. | 2, P.M. | 8, P.M. | WEATHER &c. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 65 | 68 | 63 | S.W. | | N.E. | clear cloudy |
| | 2 | 62 | 68 | 60 | N.E. | S. | | cloudy clear |
| | 3 | 60 | 68 | 58 | S.W. | S. | | clear cloudy |
| | 4 | 60 | 64 | 63 | S. E. | | S. | misty cloudy dull |
| | 5 | 64 | 75 | 70 | S. | | | dull clear |
| C | 6 | 68 | 75 | 69 | N. | S. | | clear cloudy |
| | 7 | 70 | 73 | 69 | S. | | | cloudy rain clear |
| | 8 | 69 | 75 | 63 | S.W. | W. | | clear |
| | 9 | 58 | 68 | 65 | N W | | | clear |
| | 10 | 60 | 61 | 60 | N.E. | | N. | cloudy rain clear |
| | 11 | 57 | 70 | 66 | N W | S.W. | | clear cloudy |
| | 12 | 62 | 60 | 60 | S. | S. E. | | rain |
| C | 13 | 65 | 67 | 68 | S. | N. | S.W. | dull rain clear |
| | 14 | 65 | 73 | 70 | S.W. | | | clear |
| | 15 | 69 | 75 | 71 | N. | S. | | clear |
| | 16 | 70 | 75 | 70 | S. | | | clear |
| | 17 | 70 | 80 | 74 | S. | | | clear |
| | 18 | 71 | 73 | 70 | N.E. | S. E. | E. | clear cloudy |
| | 19 | 68 | 72 | 65 | N W | | | clear cloudy clear |
| C | 20 | 64 | 72 | 68 | W. | S.W. | S. | clear |
| | 21 | 65 | 72 | 69 | N W | S. | | clear |
| | 22 | 67 | 76 | 72 | S. | W. | | clear |
| | 23 | 68 | 72 | 69 | S. | N W | N. | clear hard shower clear |
| | 24 | 68 | 70 | 69 | N. | S. | | clear cloudy |
| | 25 | 69 | 65 | 64 | S. E. | | | rain |
| | 26 | 69 | 69 | 68 | S. E. | | | dull clear |
| C | 27 | 68 | 75 | 71 | S. E. | | S. | cloudy clear |
| | 28 | 71 | 75 | 73 | S. | S.W. | S. | cloudy clear |
| | 29 | 65 | 71 | 62 | N. | W. | S.W. | clear cloudy |
| | 30 | 68 | 73 | 67 | W. | | N.E. | clear |

| Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8,A.M. | 2,P.M. | 8,P.M. | WEATHER, &c. |
|---|---|---|---|---|---|---|---|
| | *July*, 1790. | | | | | | |
| 1 | 64 | 73 | 68 | N. | N W | | cloudy |
| 2 | 66 | 74 | 74 | W. | S.W. | | clear |
| 3 | 68 | 76 | 70 | S.W. | W. | S.W. | clear |
| C 4 | 69 | 76 | 73 | S.W. | | | cloudy |
| 5 | 72 | 81 | 76 | W. | S.W. | | clear |
| 6 | 75 | 78 | 74 | S.W. | | | clear |
| 7 | 73 | 79 | 75 | S.W. | | N. | cloudy |
| 8 | 67 | 74 | 69 | N W | | | clear |
| 9 | 64 | 76 | 69 | N. | S. | | clear |
| 10 | 67 | 72 | 68 | S.W. | S. | | clear |
| C 11 | 68 | 72 | 69 | S.W. | S. | | cloudy |
| 12 | 69 | 75 | 69 | S.W. | S. | | cloudy |
| 13 | 68 | 74 | 70 | N.E. | S.W. | S. | dull |
| 14 | 69 | 76 | 71 | S. | | | clear |
| 15 | 70 | 76 | 72 | S. | | | hazy |
| 16 | 72 | 78 | 72 | S. | | | clear |
| 17 | 71 | 78 | 70 | N W | N.E. | | clear |
| C 18 | 70 | 78 | 70 | N.E. | S.E. | | cloudy |
| 19 | 68 | 72 | 69 | N.E. | E. | N.E. | rain |
| 20 | 67 | 72 | 69 | S. | S.E. | S. | cloudy |
| 21 | 68 | 76 | 74 | N W | S. | | clear |
| 22 | 72 | 79 | 73 | W. | | S. | clear |
| 23 | 75 | 70 | 76 | S.W. | S. | | cloudy |
| 24 | 75 | 80 | 76 | W. | S. E. | N. | cloudy |
| C 25 | 74 | 76 | 71 | N W | | | clear |
| 26 | 66 | 76 | 72 | N W | | S. | clear |
| 27 | 71 | 76 | 74 | S. | | S. E. | cloudy |
| 28 | 75 | 77 | 73 | N W | S. | W. | cloudy |
| 29 | 68 | 75 | 73 | N W | S. | | clear |
| 30 | 70 | 76 | 74 | S.W. | S. | | clear |
| 31 | 72 | 80 | | S.W. | S. | | clear |

| Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8,A.M. | 2,P.M. | 8,P.M. | WEATHER, &c. |
|---|---|---|---|---|---|---|---|
| | *August*, 1790. | | | | | | |
| C 1 | 68 | 75 | 68 | N. | N. E. | S. E. | dull |
| 2 | 67 | 74 | 70 | N. | S. E. | E. | cloudy |
| 3 | 69 | 69 | 67 | N.E. | | E. | dull |
| 4 | 67 | 75 | 72 | S. E. | S. | | dull |
| 5 | 72 | 80 | 77 | S.W. | S. | | cloudy |
| 6 | 75 | 82 | 77 | S. | | S. E. | clear |
| C 7 | 75 | 77 | 75 | N. | S. E. | | cloudy |
| 8 | 73 | 76 | 74 | N.E. | S. | E. | clear |
| 9 | 72 | 74 | 72 | E. | S. | F. | rain |
| 10 | 74 | 79 | 75 | S.W. | N W | | dull |
| 11 | 72 | 76 | 74 | N.E. | S. E. | S. | dull |
| 12 | 75 | 81 | 78 | S. | | | cloudy |
| 13 | 76 | 84 | 82 | W. | S.W. | S. | clear |
| 14 | 78 | 85 | 79 | S.W. | | | clear |
| C 15 | 78 | 83 | 78 | N W | S. | | clear |
| 16 | 75 | 83 | 81 | N W | S.W. | | clear |
| 17 | 76 | 83 | 77 | N W | S. J. | E. | clear |
| 18 | 76 | 78 | 70 | W. | E. | | cloudy |
| 19 | 65 | 67 | 66 | N. | | | dull |
| 20 | 64 | 69 | 66 | N. | N. E. | S. | clear |
| 21 | 65 | 69 | 66 | N. | S. E. | | cloudy |
| C 22 | 65 | 68 | 65 | N. | N. E. | S. E. | clear |
| 23 | 64 | 72 | 67 | N. | E. | | clear |
| 24 | 64 | 70 | 66 | N. | S. | | clear |
| 25 | 64 | 75 | 72 | S.W. | | | cloudy |
| 26 | 70 | 75 | 71 | W. | N W | | dull |
| 27 | 66 | 70 | 72 | N. | N.E. | S. E. | cloudy |
| 28 | 67 | 75 | 72 | N W | S.W. | | cloudy |
| C 29 | 69 | 76 | 74 | W. | S. | | clear |
| 30 | 66 | 70 | 66 | N. | | | cloudy |
| 31 | 65 | 70 | 66 | S. E. | | S. | clear |

| Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | WIND. 8, A.M. | 2, P.M. | 8, P.M. | WEATHER, &c. *September*, 1790. |
|---|---|---|---|---|---|---|---|
| 1 | 66 | 71 | 69 | S.W. | S. | S. | cloudy |
| 2 | 70 | 79 | 75 | S.W. | | | cloudy clear |
| 3 | 65 | 72 | 69 | N W | S. | | clear |
| 4 | 65 | 73 | 70 | N. | S. | S. E. | clear rain |
| C 5 | 68 | 70 | 69 | N W | W. | N W | clear and fresh gale |
| 6 | 63 | 67 | 62 | W. | N. | | cloudy clear |
| 7 | 60 | 69 | 65 | N W | S. | | clear dull |
| 8 | 64 | 69 | 67 | S. E. | S. | | dull clear |
| 9 | 67 | 74 | 69 | N.E. | S. | | clear |
| 10 | 68 | 78 | 74 | S.W. | S.W. | S. E. | cloudy clear rain |
| 11 | 72 | 78 | 73 | N. | W. | S. | clear |
| C 12 | 69 | 69 | 65 | N.E. | S. E. | | dull |
| 13 | 64 | 67 | 66 | E. | S. | S. E. | cloudy |
| 14 | 67 | 70 | 66 | S. | W. | N. | cloudy dull |
| 15 | 62 | 67 | 65 | N W | | | clear |
| 16 | 57 | 64 | 60 | N W | N. | N. | clear |
| 17 | 57 | 65 | 60 | N W | S. E. | N. | clear |
| 18 | 60 | 68 | 63 | N W | N. | | clear cloudy |
| C 19 | 58 | 62 | 60 | N. | E. | E. | cloudy drizzling |
| 20 | 58 | 64 | 62 | N. | E. | | clear cloudy |
| 21 | 63 | 69 | 68 | N.E. | S.W. | S. | cloudy clear |
| 22 | 65 | 70 | 65 | S. | | N. | dull clear hard rain |
| 23 | 58 | 68 | 58 | N W | | | clear |
| 24 | 54 | 65 | 60 | W. | S. | | clear |
| 25 | 55 | 66 | 65 | S.W. | S.W. | S. | clear cloudy |
| C 26 | 61 | 67 | 65 | S.W. | | N. | very heavy rain |
| 27 | 65 | 65 | 64 | S. | | | dull |
| 28 | 56 | 60 | 57 | N. | | | cloudy |
| 29 | 56 | 58 | 56 | N.E. | E. | | dull |
| 30 | 60 | 64 | 62 | N. | | N W | dull cloudy clear |

| Day. | HEAT. 8 o'cl. A. M. | 2 o'cl. A. M. | 8 o'cl. A. M. | WIND. 8, A.M. | 2, P.M. | 8, P.M. | WEATHER, &c. *October*, 1790. |
|---|---|---|---|---|---|---|---|
| 1 | 57 | 60 | 60 | N W | S. E. | | clear cloudy |
| 2 | 57 | 61 | 60 | N W | | | clear clear |
| C 3 | 58 | 63 | 62 | S.W. | | | rain clear |
| 4 | 66 | 71 | 66 | S.W. | W. | | cloudy flowery |
| 5 | 59 | 65 | 60 | N W | S. E. | | clear |
| 6 | 61 | 67 | 59 | S.W. | | S. | clear dull |
| 7 | 46 | 55 | 57 | N W | | N. | clear |
| 8 | 51 | 60 | 59 | W | S. | W. | cloudy |
| 9 | 63 | 55 | 56 | S.W. | N. | | rain |
| C 10 | 45 | 45 | 42 | N. | | N W | rain dull |
| 11 | 42 | 53 | 50 | N W | | | clear |
| 12 | 47 | 54 | 54 | N. | S. E. | S. | clear cloudy clear |
| 13 | 51 | 57 | 50 | N. | S. E. | N.E. | clear rain |
| 14 | 54 | 59 | 57 | N W | | | cloudy |
| 15 | 57 | 58 | 54 | W | | | cloudy clear |
| 16 | 50 | 61 | 56 | W. | N W | | cloudy clear |
| C 17 | 49 | 57 | 54 | W. | S.W. | | clear |
| 18 | 47 | 55 | 54 | S.W. | | | clear |
| 19 | 48 | 53 | 50 | N.E. | N. | | clear |
| 20 | 49 | 55 | 52 | N. | | | clear cloudy |
| 21 | 47 | 52 | 50 | N. | | | clear |
| 22 | 45 | 50 | 48 | N W | | | clear |
| 23 | 47 | 53 | 52 | S.W. | S. | | clear |
| C 24 | 48 | 56 | 54 | N W | E. | | clear cloudy |
| 25 | 50 | 56 | 56 | W. | N W | | dull cloudy |
| 26 | 48 | 44 | 40 | W. | | S.W. | clear cloudy clear |
| 27 | 39 | 44 | 45 | S.W. | | | clear cloudy |
| 28 | 44 | 56 | 54 | S.W. | | | cloudy clear |
| 29 | 53 | 59 | 56 | S.W. | | N. | cloudy rain dull |
| C 31 | 58 | 56 | 54 | W. | N W | | clear |

| | HEAT. | | | | WIND. | | | *November*, 1790. |
|---|---|---|---|---|---|---|---|---|
| Day. | 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | 8, A.M. | 2, P.M. | 8, A.M. | | WEATHER, &c. |
| 1 | 50 | 56 | 54 | N. | N.E. | N W | dull cloudy clear | |
| 2 | 53 | 56 | 53 | N W | N.E. | N W | clear cloudy clear | |
| 3 | 49 | 53 | 50 | E. | | S. | cl'y.dull,h.gale,rn.thr. | |
| 4 | 47 | 50 | 47 | N W | W. | N W | clear cloudy clear | |
| 5 | 42 | 47 | 45 | W. | N W | | clear | |
| 6 | 44 | 44 | 44 | N W | | E. | clear cloudy | |
| C 7 | 44 | 47 | 44 | S.W. | N W | | dull clear cloudy | |
| 8 | 43 | 51 | 49 | W. | S.W. | S. | cloudy clear | |
| 9 | 42 | 46 | 45 | N W | | | clear | |
| 10 | 44 | 44 | 40 | S.W. | | N W | dull clear | |
| 11 | 32 | 39 | 38 | N. | N W | | clear | |
| 12 | 33 | 43 | 41 | W. | S.W. | | clear | |
| 13 | 39 | 49 | 44 | N W | S. | | clear misty | |
| C 14 | 47 | 47 | 46 | N. | N.E. | N. | dull rain dull | |
| 15 | 47 | 55 | 49 | S.W. | S. | | clear cloudy | |
| 16 | 50 | 52 | 51 | E. | N.E. | | rain | |
| 17 | 45 | 43 | 40 | N.E. | | | rain | |
| 18 | 40 | 42 | 40 | N.E. | | N W | dull | |
| 19 | 41 | 44 | 42 | N. | | N W | dull clear | |
| 20 | 40 | 47 | 43 | N W | | N W | cloudy clear | |
| C 21 | 40 | 43 | 40 | N. | N. | | dull clear | |
| 22 | 41 | 48 | 42 | N. | | W. | clear | |
| 23 | 45 | 50 | 43 | S.W. | N W | W. | clear | |
| 24 | 40 | 45 | 39 | W. | N W | | clear cloudy | |
| 25 | 32 | 37 | 33 | N W | S.W. | E. | clear | |
| 26 | 29 | 30 | 32 | N. | | | fn.dull,cl'y.&w'd high | |
| 27 | 31 | 32 | 29 | N. | | | snow deep snow | |
| C 28 | 32 | 35 | 32 | N W | | | cloudy | |
| 29 | 31 | 36 | 35 | W. | | | cloudy | |
| 30 | 32 | 35 | 32 | N W | | | clear | |

| | HEAT. | | | | WIND. | | | *December*, 1790. |
|---|---|---|---|---|---|---|---|---|
| Day. | 8 o'cl. A. M. | 2 o'cl. P. M. | 8 o'cl. P. M. | 8, A.M. | 2, P.M. | 8, P.M. | | WEATHER, &c. |
| 1 | 27 | 34 | 31 | N W | | | | clear |
| 2 | 30 | 33 | 35 | W | N.E. | | | cloudy dull rain |
| 3 | 37 | 36 | 38 | S.W. | N W | E. | | rain cloudy |
| 4 | 35 | 33 | 36 | N W | S.W. | N W | | cloudy clear |
| C 5 | 27 | 30 | 24 | N W | | | | clear |
| 6 | 22 | 30 | 30 | N W | | | | clear |
| 7 | 31 | 25 | 22 | N W | | | | cloudy clear |
| 8 | 16 | 20 | 17 | N. | | | | clear |
| 9 | 14 | 22 | 24 | N W | N. | E. | | clear cloudy |
| 10 | 28 | 34 | 35 | N. | E. | S. E. | | light snow dull rain |
| 11 | 35 | 36 | 36 | S. E. | S. | N. | | drizzling rain |
| C 12 | 37 | 38 | 35 | N W | | | | rain clear |
| 13 | 32 | 35 | 35 | S.W. | | N W | | clear |
| 14 | 33 | 35 | 30 | N W | | | | clear |
| 15 | 23 | 27 | 28 | N W | | | | clear |
| 16 | 24 | 24 | 23 | N. | N W | | | snow |
| 17 | 17 | 20 | 17 | W. | | | | clear |
| 18 | 12 | 16 | 10 | W. | N W | | | clear |
| C 19 | 10 | 16 | 20 | W. | S. | S.W. | | clear cloudy |
| 20 | 24 | 27 | 28 | W. | S. | S.W. | | cloudy dull |
| 21 | 29 | 30 | 24 | N.E. | | N W | | snow |
| 22 | 15 | 20 | 20 | W. | N W | | | clear |
| 23 | 20 | 29 | 30 | W. | S.W. | | | clear |
| 24 | 26 | 26 | 23 | N. | | N.E. | | clear |
| 25 | 23 | 26 | 25 | N.E. | | | | dull light snow |
| C 26 | 26 | 28 | 27 | N W | S. E. | W. | | clear |
| 27 | 15 | 22 | 21 | W. | N W | W. | | clear cloudy |
| 28 | 16 | 21 | 22 | W. | S.W. | | | clear |
| 29 | 22 | 28 | 29 | S.W. | | W. | | dull |
| 30 | 16 | 19 | 19 | N W | | W. | | clear |
| 31 | 13 | 15 | 19 | N. | | N.E. | | dull |

Mean Degrees *of* Farenheit's Thermometer *for every ten Days of the Year* 1791.

| | at 8 A. M. | at 2 P. M. | Mean. |
|---|---|---|---|
| *January* | 26 | 32 | 29 |
| | 28 | 32 | 30 |
| | 27 | 31 | 29 |
| *February* | 27 | 31 | 29 |
| | 26 | 30 | 28 |
| | 30 | 32 | 31 |
| *March* | 33 | 39 | 36 |
| | 38 | 42 | 40 |
| | 41 | 47 | 44 |
| *April* | 42 | 48 | 45 |
| | 46 | 56 | 51 |
| | 52 | 60 | 56 |
| *May* | 53 | 59 | 56 |
| | 58 | 66 | 62 |
| | 65 | 73 | 69 |
| *June* | 67 | 73 | 70 |
| | 70 | 78 | 74 |
| | 70 | 76 | 73 |
| *July* | 68 | 74 | 71 |
| | 72 | 82 | 77 |
| | 73 | 81 | 77 |
| *Auguſt* | 73 | 79 | 76 |
| | 70 | 76 | 73 |
| | 72 | 80 | 76 |
| *September* | 64 | 68 | 66 |
| | 63 | 67 | 65 |
| | 63 | 67 | 65 |
| *October* | 55 | 63 | 59 |
| | 46 | 54 | 50 |
| | 45 | 51 | 48 |
| *November* | 42 | 48 | 45 |
| | 39 | 43 | 41 |
| | 37 | 45 | 41 |
| *December* | 30 | 34 | 32 |
| | 31 | 37 | 34 |
| | 26 | 34 | 30 |

# OBSERVATIONS ON THE DRILLING OF WHEAT.

By WALTER RUTHERFORD, Esquire.

GENTLEMEN,

AS I conſider Wheat as the firſt ſtaple of the trade and wealth of the middle ſtates, I beg leave to recommend a method of promoting this article, without adding to, but rather diminiſhing the expence of culture.

THE drill huſbandry has been long recommended and practiſed in England, but in a manner ſo complicated, machinery ſo expenſive, and ſucceſs ſo various, that it has never come in general practice there, nor attempted in that method in America; but ſome years ago a farmer in Somerſet county, in New-Jerſey, firſt introduced a ſeed-drill of his invention. Being a ſeed-box over a cylinder that turns with the wheels, with four holes in the box, that anſwer notches ſloped in the cylinder, by which the ſeed falls into drills at thirteen inches apart, which machine is drawn by a pair of horſes, with a tongue to turn it; when turning, the wheel to be held faſt, and bringing the wheel to run in the outſide drill; and afterwards drilling the head-lands, the whole field will be drilled at thirteen inches apart, and may put in about eight acres a day, being underſtood to be well harrowed before drilling.

THE advantages of this method is found by the experience of many farmers to be, 1ſt, It takes ſomewhat leſs ſeed—2d, The ſeed is much better covered—3d, The ridges on each ſide mouldering gradually on the green grain, prevents it from freezing out, or being winter killed—4th, It is ſheltered from the bleak ſpring winds—5th, It drains off the wet—6th, It better ſtands the drought, the roots being well covered.

WHERE the land is richly manured, perhaps this method may not be ſo neceſſary; and if the fallow is covered with large ſtones, or ſtumps of trees, it will be impracticable; but on land conſiderably exhauſted, our farmers have experienced great advantage; I reckon it yields about a third more—my neighbour, a judicious farmer, thinks it yields him double the old method. When I firſt practiſed this way, it was on a field that the year before was in ſummer grain; one part of it gave a much better crop than the reſt; without directions, the teamsman ſowed this part by hand; moſt certainly the crop proved to be the worſt part of the field, which many of the neighbours viewed, and next year began, and in general have followed this practice. Our carpenters deliver this drill compleat for eight dollars.

*New-York, Feb.* 28, 1792.

[END OF PART I.]

John Smith
Egbert T. Smith

# TRANSACTIONS

OF THE

# SOCIETY,

INSTITUTED IN THE

## STATE OF NEW-YORK,

FOR THE PROMOTION OF AGRICULTURE,
ARTS, AND MANUFACTURES.

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PART II.

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Published by Order of the Society.

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PRINTED BY CHILDS AND SWAINE, PRINTERS TO THE STATE.
M,DCC,XCIV.

IN ASSEMBLY, FEBRUARY 27, 1794.

*RESOLVED, (if the Hon. the Senate concur therein,) that the Printer to this State be directed to publiſh for the Agricultural Society of this State, Five Hundred Copies of ſuch of the Communications made to the Society, as they may deem moſt likely to promote the Intereſt of Agriculture; and that the ſaid Printer deliver one of the ſaid Copies to each Perſon who ſhall be entitled to receive the Laws and Journals of this State; and that the Legiſlature will provide for the Expence of printing the ſame.*

IN SENATE, MARCH 3, 1794.

*RESOLVED, That the Senate do concur with the Hon. Aſſembly in their ſaid Reſolution.*

# INTRODUCTION.

SINCE the publication of the firſt volume of the Society's Tranſactions in 1792, the objects for which the aſſociation was formed have been purſued with diligence. Conſiderable proficiency having been made, it has again been judged proper to lay before the public the reſult of their inquiries. The Society during the ſeſſions of 1792 and 1793, continued its meetings in the Senate chamber, in the city of New-York; and on the 29th December, 1792, Mr. G. C. Willet, from the committee appointed for that purpoſe, in purſuance of a memorial of the Society of Brewers, made the following report on the method of cultivating ſummer-barley in the ſtate of New-York, after a crop of Indian corn, to wit:

"In the fall, or early in the ſpring, as beſt ſuits the œconomy of the farmer, turn under the ſward, and keep vegetation down with the harrow until the ſeaſon of planting."

" Indian corn prepares the ground well for barley, by rendering it mellow, and deſtroying the natural growth of graſs and weeds. After gathering the corn, and removing the ſtalks, manure ſhould be carted on during the winter, or early in the ſpring; ſpread the manure, plough it in, and make the earth as mellow as poſſible: then ſow the barley early, at the rate of at leaſt two buſhels to an acre."

" If the field is to be brought into graſs, ſow graſs-ſeed with the barley, as is cuſtomary with wheat, remembering always, that clover is the moſt ſure."

" Cut the crop when ripe, and not ſooner; the leſs it is expoſed, after cutting, even to the dew, the better, and heavier is the grain. This is the ſyſtem adopted in the ſtate of Rhode-Iſland, where the farmers frequently cut about forty buſhels on an acre."

" On the weſt end of Long-Iſland, the farmers that raiſe barley, plough the ſtubble under as ſoon as the crop is off, check vegetation by repeated ploughing and harrowing, until the time of ſowing wheat, and by this management procure a good crop of wheat, in ſucceſſion to that of barley: But, in this caſe, it is neceſſary to give the ground a larger quantity of manure."

" The committee are at a loſs to ſay, whether barley will anſwer on new ground, as the growth of it has, in their belief, been chiefly confined to old cultivated land. From experience,

however, it is known, that the more northern latitudes favour the production of the beſt barley. Whence a preſumption ariſes that the northern and weſtern parts of the ſtate of New-York are well adapted, by nature, for the cultivation of this grain. Therefore, it is highly probable, that the interval land on both ſides of the Hudſon and Mohawk rivers, as well as on other ſtreams, and between many of the mountains, muſt produce good crops of barley, without the aſſiſtance of manure, every third or fourth year; and, upon the plan recommended, both the ſoil and its productions be improved, by the culture of corn, barley, and graſs-ſeeds, with now and then, if neceſſary, a ſeaſonable manuring."

"It is difficult to procure barley free from an admixture of oats: The beſt method of ſeparating the oats from it is by means of water—take a large tub, filled with water, and let the barley run ſlowly into it; the oats and light grains will ſwim on the ſurface, and muſt be ſkimmed off—the heavy and vigorous grains of barley will ſink to the bottom, and ought to be preſerved for ſowing; theſe being the beſt of ſeeds."

"This grain ſeparates very eaſy from the ſtraw; but the beard that adheres to the end of the grain muſt be ſeparated by threſhing it over again after the ſtraw is pitched off. It may be threſhed very well by hand, though horſes, or indeed cattle, will tread off the beard more eaſily than it can be removed by the flail."

"Barley-ſtraw is hearty fodder for horned cattle in the winter.

"By cultivating barley, the farmer will be enabled, with induſtry, to receive his money for a crop in ſix or ſeven months from the time of ſowing; the fall of the year being the time for bringing it to market, and the brewers inſuring him five ſhillings and ſix-pence the buſhel, or, if he prefers it, the market price."

Which being agreed to, the ſame was directed to be publiſhed.

By order of the Society,

S. L. MITCHILL, Secretary.

Col. John Smith produced the model of a plough-ſhare, according to which it was projected to have that utenſil made of *caſt iron*, in order to ſave expence in huſbandry, and come cheaper to farmers than thoſe in common uſe, forged from *wrought iron*; and Mr. Smith and Judge Hobart were appointed to get ſeveral caſt for trial.

Dr. Mitchill preſented to the Society Mr. Kerr's tranſlation of Mr. Berthollet's new method of bleaching by means of the oxygenated muriatic acid; which proceſs has been ſince very ſucceſsfully applied to the paper manufacture, in Europe, as appears by a printed book ſent from Scotland, part of whoſe paper was bleached in that way. The book is in Mr. Mitchill's hands for the inſpection of ſuch manufacturers as wiſh to view it.

Mr. Chancellor Livingſton, the Preſident, preſented a letter from a Society of Gentlemen in Albany, aſſociated for the purpoſe of promoting the manufacture of ſugar from the maple-tree, ſoliciting their friendly aid in procuring legiſlative countenance and aſſiſtance, in encouraging the manufacture of that article of domeſtic produce by premiums or bounties. This letter was accompanied by various ſamples of the ſugar of different qualities preſented by the manufacturers to the Albany-Aſſociation, for which, already, premiums had been given; and by the hiſtory of that aſſociation, &c. After this letter and the accompanying papers had been read, and the ſamples of ſugar inſpected, it was ordered that the Preſident ſhould draft and forward to the legiſlature a memorial on the ſubject, to concur with the memorial on the ſame ſubject from the gentlemen of Albany.

Mr. Simeon De Witt was appointed to collect meteorological obſervations and regiſters, from whatever ſources he may be able, throughout the ſtate.

The Preſident communicated a French memoir from Mr. Chanlat, reſpecting the improvement of huſbandry and farming in the neighbourhood of New-York, and reciting ſome experiments of his own for the promotion of agriculture in France.

Dr. Mitchill communicated to the Society, a memoir of Mr. Ezra L'Hommedieu, on the method of catching porpoiſes and manufacturing their ſkins into leather, at the eaſt end of Long-Iſland; and a memoir on the culture of daiſy-graſs on exhauſted ſoils; and a memoir on the improvement of impoveriſhed lands by ſowing clover; and alſo a hiſtory of his experiments on manuring land with drift-ſea-weed, green ſea-weed and Indian ſhells:—And alſo an eſſay on hedges and ditches, with a view of the cauſes of the deſtruction of prim and white-thorn hedges, in the towns of Eaſt-Hampton and South-Hampton in Suffolk county, Long-Iſland; and propoſing to ſupply their place with the native thorn of our country.

Mr. Recorder Jones communicated an eſſay written by Peter De La Bigarre, on the making of hedges and incloſures with white-mulberry-trees, founded on experience of their utility in France; and of their uſe at the ſame time in affording food for ſilk-worms on their leaves in the open air:—

Alſo a memoir on the importance of agricultural inſtitutions and on the propriety of applying to the legiſlature during the preſent ſeſſion for an act of incorporation.

A ſpecial meeting was called in purſuance of Mr. De La Bigarre's propoſal, and a committee appointed to apply to the legiſlature for an act of incorporation. The act is in the following words:—viz.

*An Act to incorporate the Society inſtituted in the State of New-York, for the promotion of Agriculture, Arts and Manufactures.*

Paſſed the 12th of March, 1793.

"WHEREAS ſeveral perſons in the State of New-York, have by a voluntary agreement, aſſociated themſelves for the laudable purpoſe of promoting Agriculture, Arts and Manufactures in this State.

"*And whereas* the ſaid Society have preſented a petition to the Legiſlature, ſetting forth, that the petitioners conſidering that the wealth and proſperity of a country, very much depend upon the flouriſhing ſtate of its Agriculture, Arts and Manufactures; and obſerving the benefit which in other countries have accrued from the inſtitution of ſocieties, for the purpoſe of encouraging thoſe great objects, have voluntarily aſſociated themſelves, with a view of collecting from different parts of the State, the different modes of Agriculture that are in practice; to ſuggeſt ſuch improvements as may be found to be beneficial; to excite among their fellow citizens, a ſpirit of making experiments for the amelioration of lands which have been exhauſted, or in their natural ſtate are unproductive or unfit for cultivation; for increaſing the produce of ſuch articles as are propagated amongſt us, and promoting the culture of others which have been found uſeful in other parts, and for the improvement of field-huſbandry in general: and to introduce, as far as circum-

ſtances may render proper, an emulation for the eſtabliſhment of uſeful Arts and Manufactures in thoſe parts of the State, where they can be beneficially carried on. That the petitioners conceive it would greatly conduce to advance the important ends of their aſſociation, if they were authorized to act as a corporate body, and poſſeſs property to ſuch amount as would enable them to effectuate their purpoſes more ſatisfactorily to themſelves, and more beneficially to the public: They therefore prayed, that the Legiſlature would be pleaſed by law to incorporate the Society for the purpoſes aforeſaid, under ſuch limitations and reſtrictions as to the Legiſlature ſhall ſeem meet:—Therefore

"*BE it enacted by the people of the State of New-York, repreſented in Senate and Aſſembly*, That Robert R. Livingſton, John Sloſs Hobart, Samuel L. Mitchill, John M'Keſſon, Matthew Clarkſon, Samuel Bard, John Cantine, Samuel Jones, Thomas Tillotſon, Joſeph Haſbrouck, James G. Graham, Jacobus Swartwout, Melancton Smith, Abraham Hardenburgh, John Gelſton, William W. Gilbert, David R. Floyd Jones, George Clinton, Aquila Giles, Ezra L'Hommedieu, John Schenck, James Hunter, Egbert Benſon, John Blagge, John P. Delancey, Francis Childs, John Watts, Peter Vandervoort, Henry Will, Ebenezer Purdy, Joſiah Ogden Hoffman, John Smith of Suffolk county, Cornelius J. Bogart, William Dunlap, Walter Rutherford, Philip Van Cortlandt, John Williams, Richard Varick,

John Jay, Elias Newman, Amaſa Dingley, Gilbert Colden Willett, Stephen Luſh, John Stevens, John Kemp, Abraham Beach, Samuel Nicoll, Jonathan N. Havens, John L. Gardner, Frederick Rhynelander, Pierre De La Bigarre, Edward Livingſton, John Thurman, Jeremiah Van Renſſelaer, James Duane, Simeon De Witt, Nathaniel Sacket, William Rhinelander, Samuel Ruſſell, Moſes De Witt, David Frederick Laring, John Nicholſon, Andrew King, John Barber, Joſeph Barber, Johannes Miller, William Thompſon, David Ogden, John Delafield, Horatio Gates, Benjamin Strong, and Samuel Jones, junior, and ſuch other perſons as ſhall from time to time become members of the ſaid ſociety, ſhall be, and hereby are ordained, conſtituted, and declared, to be one body corporate and politic, in deed, fact, and name, by the name of *The Society for the promotion of Agriculture, Arts, and Manufactures;* and that by that name, they and their ſucceſſors, until the firſt day of May, one thouſand eight hundred and four, ſhall have ſucceſſion, and ſhall be perſons in law capable of ſuing and being ſued, pleading and being impleaded, anſwering and being anſwered, defending and being defended in all courts and places whatſoever, in all manner of actions, ſuits, complaints, matters and cauſes whatſoever: And that they and their ſucceſſors may have a common ſeal, and may change and alter the ſame at their pleaſure; and that they and their ſucceſſors, by the ſame name, ſhall be perſons capable in law, to purchaſe, take, receive, hold, and enjoy

to them and their ſucceſſors, any real eſtate in fee ſimple, or for term of life or lives, or otherwiſe; and any goods, chattels, or perſonal eſtate, for the purpoſe of enabling them the better to carry into execution, encourage, and promote ſuch meaſures, as may tend to promote Agriculture, Arts, and Manufactures in this State."

*Provided*, The clear yearly value of ſuch real and perſonal eſtates, ſhall not exceed the ſum of eight hundred pounds, lawful money of New-York, and that they and their ſucceſſors ſhall have full power and authority, to give, grant, ſell, leaſe, demiſe and diſpoſe of the ſaid real and perſonal eſtates, or any part thereof, at their will and pleaſure; and that they and their ſucceſſors ſhall have power from time to time, to make, conſtitute, ordain and eſtabliſh, ſuch bye-laws, conſtitutions, ordinances and regulations, as they ſhall judge proper for the election of their officers; for the election or admiſſion of new members of the ſaid corporation, and the terms and manner of admiſſion; for the better government and regulation of their officers and members; for fixing the times and places of the meeting of the ſaid corporation; and for regulating all the affairs and buſineſs of the ſaid corporation.

*Provided*, That ſuch bye-laws and regulations ſhall not be repugnant to the conſtitution or laws of the United States, or of this State. And for the better carrying on the buſineſs and

affairs of the ſaid corporation, there ſhall be a Preſident, Vice-Preſident, Treaſurer and two Secretaries of the ſaid corporation, who ſhall hold their offices from the time of their appointment or election, until the ſecond Tueſday of January then next, and until others ſhall be choſen in their places. And that the ſaid Robert R. Livingſton, is hereby appointed Preſident; the ſaid John Sloſs Hobart, Vice-Preſident; the ſaid Samuel Jones, Treaſurer, and the ſaid Samuel L. Mitchill and Samuel Jones, junior, Secretaries of the ſaid corporation; and that their ſucceſſors in office ſhall hereafter be choſen by the members of the ſaid corporation, in ſuch manner and at ſuch times and places, as ſhall be directed by the bye-laws of the ſaid corporation to be made for that purpoſe; and that the Preſident or Vice-Preſident, and any twelve or more of the members of the ſaid corporation, ſhall be ſufficient to conſtitute a legal meeting of the ſaid corporation.

*And be it further enacted*, That the members of the Legiſlature, who ſhall not be ſtiled members of the ſaid corporation, be nevertheleſs in virtue of their ſtations, honorary members of the ſaid corporation, and ſhall ſit but not vote as ſuch for officers, or have any voice in the diſpoſition of their funds.

Mr. Mitchill communicated a letter from Mr. Woodruff, of Albany, relative to the ſeeds of the Maple-Sugar Tree, and accompanied by a box of the ſeeds. Several of the members of

the Society took parcels of the ſeeds, with a view of making experiments on their growth; and were directed to report the event of them, at the next ſeſſion.

Mr. De La Bigarre reported from his enumeration and experiment, that a pound of large red Clover-Seed contains about two hundred and ſix thouſand grains; and a pound of Lucern-ſeed contains about one hundred and two thouſand.

The Preſident preſented a memoir by Mr. De La Bigarre, relative to the nature, cultivation and produce of ſeveral ſpecies of graſſes, chiefly from his own experience.

Mr. De La Bigarre preſented a letter from the Preſident of the United States to the Preſident of the Society, expreſſive of his pleaſure on hearing of the eſtabliſhment and progreſs of the Society.

Mr. Mitchill preſented a letter from Mr. Valentin of Cape-François, together with the following donations: to wit—1. The Charter, liſt of members and minutes of the proceedings of the Royal Society of Arts and Sciences in Saint Domingo—2. The firſt volume of their Tranſactions and one of their public orations—3. Travels to Guaxaca, by Monſieur Menonville, with a treatiſe on the cultivation of nopal, and the management of the cochineal-inſect, 2 vols. 8vo. with coloured plates—4. A pamphlet on the diſeaſe called Tetanus, compiled and publiſhed by order of that Society.

Mr. Preſident made a communication concerning ſheep.

Mr. Preſident, Mr. Jones, and Mr. Mitchill, were elected Members of the Committee of Publication and Review.

Mr. Ruſſel, in behalf of the Committee appointed for that purpoſe, made the following report on the cultivation of hops, viz.

*The Committee appointed to inveſtigate and report the beſt method of raiſing* HOPS, *offer the following as the moſt perfect the ſhortneſs of the time would allow them to collect.—Suggeſting at the ſame time the propriety of a further examination of the ſubject, embracing improvements which time and experience are continually unfolding.*

A RICH deep ſoil, rather inclining to moiſture, is, on the whole, the beſt adapted for the cultivation of Hops; but it is obſervable, that any ſoil, (ſtiff clay only excepted), will ſuit the growing of hops when properly prepared —and in many parts of Great Britain they uſe the bog-ground, which is fit for little elſe. The ground on which hops are to be planted, ſhould be made rich with that kind of manure beſt ſuited to the ſoil, and rendered fine and

mellow by being plowed deep and harrowed ſeveral times. The hills ſhould be at the diſtance of ſix or eight feet from each other, according to the richneſs of the ground.—On ground that is rich, the vines will run the moſt, the hills muſt therefore be the fartheſt apart.

At the firſt opening of the ſpring, when the froſts are over, and vegetation begins, ſetts, or ſmall pieces of the roots of hops, muſt be obtained from hops that are eſteemed the beſt* —cut off from the main ſtalk or root, ſix or eight inches in length. Branches, or ſuckers, moſt healthy, and of the laſt year's growth, muſt be ſought for. They may eaſily be known by their looking white. Two or three joints or buds ſhould be left on each ſet. The ſets ſhould be put into the ground as ſoon as taken up, if poſſible; if not, they ſhould be wrapped in a cloth, kept in a moiſt place excluded from the air. A hole ſhould then be made large and deep, and filled with rich mellow earth. The ſprouts ſhould be ſet in this earth with

* Of the different kind of hops, the long white is moſt eſteemed. It yields the greateſt quantity, and is moſt beautiful. The beauty of hops conſiſts in their being of a pale bright green colour. Care muſt be taken to obtain all of one ſort: but if different ſorts are uſed, they muſt be kept ſeparate in the field; for there is in different kinds of hops a material difference in their time of ripening; and if intermixed will occaſion extra trouble in gathering.

the bud upwards, and the ground preſſed cloſe around them. If the buds have begun to open, the uppermoſt muſt be left juſt out of the ground; otherwiſe, cover it with the earth an inch. Two or three ſetts to a pole will be ſufficient, and three poles to a hill will be found moſt productive. Place one of the poles towards the north, the other two at equal diſtances about two feet apart. The ſetts are to be placed in the ſame manner as the poles, that they may the eaſier climb. The length of the poles may be from fourteen to eighteen feet, according as the ſoil is for richneſs. The poles ſhould be placed inclining towards each other as to meet at the top, where they may be tied. This is contrary to the European method, but will be found beſt in America. In this way they will ſtrengthen and ſupport each other, and form ſo great a defence againſt the violent guſts of wind, to which our climate is frequently ſubjected in the months of July and Auguſt, as to prevent their being blown down. They will likewiſe form a three-ſided pyramid, which will have the greateſt poſſible advantage from the ſun. It is ſuggeſted by experience, that hops which grow near the ground are the beſt. Too long poles are not good, and care muſt be taken that the vines do not run beyond the poles: twiſting off their tops will prevent it. The beſt kinds of wood for poles are the Alder, Aſh, Birch, Elm, Cheſnut, and Cedar. Their durableneſs is directly the reverſe of the order in which they ſtand, and

burning the end put into the ground will be of ſervice to preſerve them. Hops ſhould not be poled till the ſpring of the ſecond year, and then not till they have been dreſſed. All that is neceſſary for the firſt year, is to keep the hops free from weeds, and the ground light and mellow, by hoeing often; and plowing if the yard is large enough to require it. The vines when run to the length of four or five feet, ſhould be twiſted together to prevent their bearing the firſt year, for that would injure them. In the months of March or April of the ſecond year, the hills muſt be opened, and all the ſprouts, or ſuckers, cut off within an inch of the old root, but that muſt be left entire with the roots that run down;* then cover the hills with fine earth and manure. The hops muſt be kept free from weeds, and the ground mellow, by hoeing often through the ſeaſon, and hills of earth gradually raiſed around the vines during the ſummer. The vines muſt be aſſiſted in running on the poles with woolen yarn, ſuffering them to run with the ſun.

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* Hops muſt be dreſſed every year as ſoon as the froſt will permit. On this being well done, depends in a great meaſure the ſucceſs of the crop. It is thought by many to be the beſt method to manure the hop-yard in the fall, and cover the hills entirely with manure; aſſerting, with other advantages, that this prevents the froſts during the winter, from injuring the hop. The truth of this may be determined by experiments in our climate and country.

By the laſt of Auguſt or firſt of September, the hops will ripen and be fit to gather. This may eaſily be known by their colour changing, and having a fragrant ſmell: their ſeed grows brown and hard.* As ſoon as ripe, they muſt be gathered without delay, for a ſtorm, or froſts, will injure them materially. The moſt expedient method of picking hops, is to cut the vines three feet from the ground, pull up the poles and lay them on crotches horizontally, at a height that may be conveniently reached. Put under them a bin of equal length, and four may ſtand on each ſide to pick at a time. Fair weather muſt be taken to gather hops in, if poſſible; and hops ought not to be gathered when the dew is on them, for dew is apt to make them mould. They ſhould be dried as ſoon as poſſible after they are gathered; if not immediately, they muſt be ſpread on a floor to prevent their changing colour. The beſt mode of drying them is with a fire of charcoal, on a kiln covered with hair-cloth, in the manner of a malt-kiln.† The fire muſt be kept ſteady and equal, and the hops ſtirred gently. Great attention is neceſſary in this part of the buſineſs,

* Hops had better be gathered before they are quite ripe, than remain till they are over ripe; for then they will looſe their ſeed by the wind, or on being handled. The ſeed is the ſtrongeſt part of the hop, and they will loſe their green colour, which is very valuable.

† Mats made of the ſplinters of walnut, or aſh, will anſwer the purpoſe, and come cheaper than hair cloth.

that the hops be uniformly and ſufficiently dried: if too much dried they will look brown, as if they were burnt; and if too little dried they will loſe their colour and flavour. They ſhould be laid on the hair-cloth about ſix inches thick, after it had been moderately warmed; then a ſteady fire kept up till the hops are nearly dry, leſt the moiſture or ſweat, that the fire has raiſed, ſhould fall back and change their colour. After the hops have been in this ſituation about ſeven, eight, or nine hours, and have got through ſweating; and when ſtruck with a ſtick, will leap up, then throw them into a heap; mix them well and ſpread them again, and let them remain till they are all equally dry. While they are in the ſweat, it will be beſt not to move them for fear of burning them. Slacken the fire when the hops are to be turned, and increaſe it afterwards. Hops are fully dried when their inner ſtalks break ſhort, and their leaves are criſp and fall off eaſily. They will crackle a little when their ſeeds are burſting; and then they muſt be taken from the kiln. Hops that are dried in the ſun, loſe their rich flavour, and if under cover, they are apt to ferment and change with the weather, and loſe their ſtrength. Fire preſerves the colour and flavour of hops by evaporating the water, and retaining the oil of the hop. After the hops are taken from the kiln, they ſhould be laid in a heap to acquire a little moiſture to fit them for bagging. It would be well to exclude them from the air, by covering

them with blankets. Three or four days will be ſufficient for them to lie in that ſtate. When the hops are ſo moiſt that they may be preſſed together without breaking, they are fit for bagging. Bags made of coarſe linen cloth, eleven feet in length, and ſeven in circumference, which hold two hundred pounds weight, are moſt commonly uſed in Europe: but any ſize that beſt ſuits may be made uſe of. To bag hops, a hole is made through a floor large enough for a man to paſs with eaſe: the bag muſt be faſtened to a hoop larger than the hole, that the floor may ſerve to ſupport the bag. For the convenience of handling the bags, ſome hops ſhould be tied in each corner to ſerve as handles. The hops ſhould be gradually thrown into the bag, and trod down continually till the bag is filled. The mouth of the bag muſt then be ſown up, and the hops are fit for market. The harder hops are packed, the longer and better they will keep; but they muſt be kept dry. In moſt parts of Great Britain where hops are cultivated, they eſtimate the charges of cultivating an acre of hops at forty-two dollars for manuring and tilling, excluſive of poles and rent of land. Poles they eſtimate at ſixteen dollars per year, but in this country they would not amount to half that ſum. An acre is computed to require about three thouſand poles, which will laſt from ſix to twelve years, according to the kind of wood uſed.

The Engliſh growers of hops think they have a very

indifferent crop, if the produce of an acre does not ſell for one hundred and thirty-three dollars, and frequently they ſell for two hundred dollars; and have been known to riſe as high as four hundred dollars. In this country experiments have been equally flattering. A gentleman in Maſſachuſetts, in the ſummer of 1791, raiſed hops from one acre of ground that ſold for three hundred dollars; and land is equally good for hops in this ſtate. Upon the loweſt eſtimate we may fairly compute the nett profit of an acre of hops to be eighty dollars, over and above poles, manure and cultivation.

There is one circumſtance farther we think has weight, and ought to be mentioned. In the Engliſh eſtimate, the expence put down, is what they can hire the labour done for by thoſe who make it their buſineſs to perform the different parts of the cultivation. A great ſaving may therefore be made by our farmers in the article of labour; for much of it may be performed by women, children, and the aged. Add to this, we have another advantage of no ſmall moment. In this country the hop harveſt will come between our two great harveſts, the Engliſh and Indian, and interfere with neither: but, in England, the grain and hop harveſt interfere, and create a great ſcarcity of hands, it then being the moſt buſy time in the year. It is found by experience, that the ſoil and climate of the Eaſtern States are more favourable to

the growth of hops than Great Britain; they not being ſo ſubject to moiſt foggy weather of long continuance; which is moſt injurious to hops. And the Southern States are ſtill more favourable to the hop than the Eaſtern States, in point of flavour and ſtrength. The State of New-York unites ſome advantages from either extreme of the Union. The cultivators of land in this State have every inducement which policy or intereſt can afford, to enter with ſpirit into the cultivation of hops. We ſhall therefore be enabled to ſupply our own demand, and export this article, inſtead of ſending abroad for all we uſe; and no crop that can poſſibly be put on land, will yield an equal profit. This culture will require but little land—the labour may be performed at intervals, ſo as not to interfere or injure the other buſineſs of the farm, by the aged, women, and children.

There is no farmer of this ſtate but may, with eaſe, raiſe from one quarter of an acre, to as much as three or four acres of hops, the advantage of which would, in a few years, be moſt ſenſibly felt, both by the individual concerned, and by the State at large.

In the city of New-York there are at preſent a number of very large and reſpectable breweries eſtabliſhed, and new ones are continually erecting. Theſe breweries not only ſupply this State and the ſhipping with beer, but alſo the greateſt

part of the four Eaſtern States; as there is not a ſingle brewery, of any conſequence, in all thoſe ſtates. It is, however, a fact no leſs mortifying than true, that moſt of the malt, and all the hops the New-York breweries uſe, are raiſed in the Eaſtern States. If the farmers of the State of New York would but make the experiment, they would find the cultivation of hops ſo much for their intereſt, that very ſoon we ſhould have hops in ſuch plenty, as not only to ſupply our own conſumption, but for exportation. In ſome parts of this ſtate, there is exiſting a ſtill farther inducement for the growing of hops; which is this, the ſoil is unfriendly to the cultivation of the Apple-tree, and Beer is an excellent ſubſtitute for Cyder, affording more nouriſhment than either Rum or Cyder, and is a much greater preſervative of health and morals.

Mr. Dingley made a Report from the Committee appointed for that purpoſe, of the following plan for the eſtabliſhment of different Branches of this Society in the different Counties of the State, to wit:

1. YOUR Committee are of opinion, that the Inſtitution of *County Societies*, will happily co-operate with the *State Society* in facilitating the diffuſion of Agricultural knowledge in general: And that this plan will alſo excite a ſpirit of

emulation among practical farmers in the various parts of the State, which will lead to important improvements, both in husbandry and gardening: Economics, arts, and manufactures, by this means, in the course of a few years will, in all probability, be greatly benefited."

"2. Under the influence of these sentiments, the committee believe, that it should be strongly recommended to the members of this Society, who reside in the several counties, and to such other persons as are willing to contribute their assistance in advancing so laudable an institution to associate themselves, and establish Agricultural Societies in their respective counties, on a plan similar to that which has been adopted by this Society; and the several Societies thus to be instituted, are to be considered as branches or appendages of the State Society:—And further, that each Society thus established, should be invited to communicate the result of their observations and experiments to the State Society, as often as they can make it convenient:—And also, that each County Society should be furnished with all the publications on Agriculture in America, as well as the most approved European publications. This will lay the foundation of County Libraries for the promotion of information in every town and neighbourhood in the whole State, and will doubtless in a few years, be the means of disseminating much useful knowledge. But it is

intended that each County Society ſhall always defray its own expences."

"3. In order to encourage the eſtabliſhment of County Societies, the Committee are of opinion, that this Society ſhould unanimouſly agree, that all the members of the ſeveral County Societies, hereafter to be choſen, ſhould always be conſidered as members of the State Society, under the ſame reſtrictions as are propoſed in the act of incorporation, for the members of the Legiſlature when they attend the meetings of this Society."

The Preſident communicated to the Society his correſpondence with John Broome, Preſident of the Chamber of Commerce in the City of New-York, reſpecting the introduction of plants and animals from foreign places, which is as follows:

*SIR,* *New-York, 5th Dec.* 1793.

THE Legiſlature having, with a view to commercial and agricultural intereſts, been pleaſed to incorporate your Chamber, and the Society for the promotion of Agriculture and Uſeful Arts, over the latter of which I have the honour to preſide, it becomes our duty mutually to forward their views in the formation of theſe corporations. There can be little doubt that the profitable commerce of this country muſt be founded upon its agriculture, and that its agriculture derives new

vigour from the extenſion of its commerce. In theſe views, our intereſt and that of the State are too cloſely connected to permit me to doubt the readineſs of the reſpectable corporation over which you preſide, to attend to every object which may intereſt our agriculture; nor will they, Sir, I truſt, find any difficulty in believing that the Agricultural Society will cheerfully embrace every means that they ſhall ſuggeſt for extending the commerce of this State. The requeſt which I am now to make, on the part of the Society in which I preſide, will indeed rather be a tax upon the public ſpirit of the members individually, than upon the Chamber; but it is a tax which I am ſatisfied that they will readily pay, if it meets the approbation, and is recommended by the corporation. In this perſuaſion, I incloſe a draft of general inſtructions for captains of veſſels ſailing in the employ of the members of your Chamber, with a requeſt on the part of the Society, for the Promotion of Agriculture and Uſeful Arts, that they may, under the patronage of the Chamber of Commerce, be recommended to their care and attention. Not having yet had any opportunity of conſulting the Society on this ſubject, I ſhall hold myſelf perſonally bound for any reaſonable expence that may be incurred. If the Chamber of Commerce ſhould adopt the inſtructions, with any alterations that they may deem proper, the Secretary of the Agricultural Society, SAMUEL L. MITCHILL, Eſq; on their being ſent to him,

will have a number of copies printed and diſtributed to the members of your Society, who will be pleaſed to give them, or ſuch of them as they may reſpectively aprove, in charge of the captains of their veſſels, and direct them to be ſtuck up in their cabbins.

I have the honour to be, Sir,
With much conſideration and eſteem,
Your moſt obedient humble ſervant,
ROBERT R. LIVINGSTON.

JOHN BROOME, Eſq;
*Preſident of the Chamber of Commerce.*

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*At a ſtated Meeting of the* NEW-YORK CHAMBER *of* COMMERCE, *held at their Chamber the 7th of Jan.* 1794.

A COMMUNICATION of the Society for the Promotion of Agriculture and Uſeful Arts, by letters from ROBERT R. LIVINGSTON, Eſq; Preſident, and SAMUEL L. MITCHILL, Eſq; Secretary, was read, and the object of that communication being approved, it was, upon motion, reſolved—

That the Corporation of the Chamber of Commerce of the State of New-York, in the United States of America, recommend a compliance with the following Inſtructions, to all Captains of veſſels ſailing from this port to Aſia, Africa,

the North of Europe, or the Southern or Weſtern parts of North-America, as far as may be done with perfect ſecurity to the property and intereſt of their owners; and that they may cauſe a fair printed copy thereof, with which they will be furniſhed, to be ſtuck up in their reſpective cabbins.

*By order of the Chamber,*
JOHN BROOME, Preſident.
*Atteſt.* WM. LAIGHT, Secretary.

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*INSTRUCTIONS to Captains of Veſſels ſailing to any part of Aſia, Africa, the North of Europe, the Southern or Weſtern parts of North-America.*

*Firſt.* PROCURE a ſmall quantity, not exceeding one quart, of thoſe kinds of grain which make the principal food of the inhabitants, and this even though it ſhould be wheat, barley, rye, oats, or maize; for though thoſe grains are common in this country, yet there are varieties which may be extremely important, as was inſtanced in the accidental introduction of the white-bearded wheat, which was found to reſiſt the inſect when every other ſpecies was deſtroyed by it.

*Second.* Procure alſo ſmall quantities of the ſeeds of thoſe kinds of pulſe and legumens which are of any eſtimation in

the opinion of the inhabitants of the country you viſit, with inſtructions for their proper cultivation, of which a minute ſhould be made upon the ſpot.

*Third.* In countries where the rigour of the climate compels the inhabitants to procure dry food for their cattle in the winter, inquire what that food is, whether hay, grain, or roots: obtain ſeeds of the ſpecies of graſs from which they make their hay, if not ſimilar to that in common uſe here; and a ſmall quantity of the grain and roots, with the modes of cultivation.—Procure the ſeeds and ſtones of ſuch fruits as ſhall appear to you of importance to this country, or which are not known here, tropical fruits only excepted, ſince there is little proſpect of their ſucceeding in this climate. This exception is not, however, to apply to annual fruits, ſince they may probably ſucceed here.

*Fourth.* Remark any differences that may diſtinguiſh the cattle, either uſed for food or draft, in the country you viſit, from thoſe found here; make notes of the variance, and communicate your obſervations to the Preſident or Secretary of the Agricultural Society, in order that if any advantage ſhould reſult from their introduction, the Society may take meaſures to import them.

*Fifth.* Be particularly attentive to the breed of ſheep, and whenever they ſhall appear ſuperior to thoſe of this ſtate, either

in ſize, or in the *fineneſs* or the quantity of the wool proportioned to the ſize of the ſheep (for ſmall ſheep may be very valuable if their fleeces ſhould be fine) to import if poſſible a pair of them, or a ram at leaſt, particularly if you ſhould be able to obtain the ſheep of Spain or Barbary, which are amongſt the moſt valuable, even though they ſhould not appear to you ſuperior to thoſe of this country. Sheep from China would alſo be deſirable, as would thoſe of the fine wool kind from India, Angora, and other parts of Aſia. There is alſo a ſpecies of fine white long haired goat in Africa, the ſkin of which is uſed for muffs; it would be deſirable to procure a pair of theſe if it could be conveniently done.

*Sixth.* South-America affords a ſpecies of ſheep, (the Vigone or Peruvian ſheep) which if introduced and found to ſuit the climate, would be an invaluable treaſure. From the ſame country, the Gulph of Mexico, and the Bay of Honduras, Cayenne, &c. may be brought the Pecari, which is a ſmall and ſingular ſpecies of wild hog: This may, on experiment, be found worth while to domeſticate here, if a pair of them could be conveniently procured.

*Seventh.* If any land or water fowl, not known in this country, ſhould be domeſticated in the country you viſit, you will procure a few of them; amongſt which may be remembered the Hoco of the Brazils and Cayenne. It is nearly of the ſize

of a turkey, black, and frequently domeſticated. It is known by various names.

*P. S.* You will obſerve that it is not expected that you ſhould bring any ſheep from England or Ireland, or any other country from which the exportation is prohibited, as you are on no account to incur any perſonal riſk, or hazard the property of your owners.

*New-York, February* 10, 1794.

*SIR,*

AT a meeting of the Chamber of Commerce next after the receipt of your letter of 5th December, I did myſelf the honour to lay it before them, together with the Inſtructions to Captains of veſſels, ſailing to any part of Aſia, Africa, the North of Europe, the Southern or Weſtern parts of North America; and at the ſame time recommended them to their patronage, with which they cheerfully complied:—A copy of the reſolution of the Chamber thereon, together with the Inſtructions, I have ſent to Mr. Mitchill, Secretary to the Agricultural Society; wiſhing the laudable end you thereby propoſe, may be fully anſwered.

I have the honour to remain,
With great conſideration and regard,
Sir, your moſt obedient Servant,
JOHN BROOME.

Hon. ROBERT R. LIVINGSTON, Eſq.

The Secretary informed the Society, that the Legiſlature, by an Act paſſed April 12, 1792, had granted the ſum of *L.* 750 for five years to the Truſtees * of Columbia College, for the purpoſe of endowing additional Profeſſorſhips, and that

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* [*THE Editors truſt they will be excuſed for inſerting the following account of the preſent ſtate of Learning in Columbia College, as contained in Mr. Mitchill's report to the Senatus Academicus in July*, 1794.]

THE College conſiſts of two Faculties; 1. *The Faculty of Arts*, compoſed of the Preſident and ſeven Profeſſors; and, 2. *The Faculty of Phyſic*, comprehending the Dean and ſeven other Profeſſors.

The Plan of Inſtruction is as follows:

I. Under the Faculty of Arts.

1. The Preſident, WILLIAM SAMUEL JOHNSON, LL. D. is Lecturer in Rhetoric and Belles Lettres, and inſtructs the Students in the grammar and proper pronunciation of the Engliſh language, on the plan of Webſter's and Lowth's grammars, and Sheridan's rhetorical grammar. In rhetoric, on the plan of Holme's and Sterling's rhetoric; and in Belles Lettres, on the plan of Blair's lectures; together with ſuch other obſervations and elucidations as, from time to time, appear neceſſary and expedient, ſo as to comprehend, as far as poſſible, a complete courſe of inſtruction in the Origin, Nature, and Progreſs of Language in general, and of the Engliſh language in particular; in the art of writing and ſpeaking it with propriety, elegance and force—the rules and principles of every ſpecies of eloquence—the principles of true taſte, and the rules of juſt criticiſm, whereby the Students may be enabled to judge properly of each ſpecies of compoſition in every branch of elegant literature: and that they may apply the whole to practice, each Student is obliged, every Saturday, to deliver him a compoſition, in which he corrects the errors, either in orthography, grammar, ſtyle, or ſentiment, and makes the neceſſary obſervations on them, when he returns the compoſition to the writer.

the Truſtees had inſtituted, amongſt others, a Profeſſorſhip for Natural Hiſtory, Chemiſtry, and Agriculture, with a ſalary of *L.* 200 a year: and that Lectures had been given upon the different parts of the courſe. The claſs was as

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2. Moral Philoſophy is taught by Profeſſor JOHN DANIEL GROS, S. T. D. The ſyſtem of that ſcience in Columbia College, comprehends an *Introductory Treatiſe* on the different ſtates and conditions of man—the nature of man—the powers and faculties of the human mind, which diſtinguiſh him from the reſt of animated nature on earth; as a moral agent accountable to God and his fellow creatures for his actions and the uſe of thoſe powers.—Then follows a three-fold diviſion of the courſe: 1. The firſt explaining the Principles and Laws reſulting from the nature of man, and his natural relations to God and his fellow creatures, by which human conduct ought to be regulated in a manner becoming the dignity of human nature, and conformable to the will of God. This conſtitutes the *Law of Nature* ſtrictly ſo called, and treats of actions good, bad, and indifferent—of moral obligation—of the ſcope of natural laws, their extent and tendency to our happineſs—of the different degrees of good, evil, merit and demerit in our actions—of moral imputation; the idea of rectitude in human conduct, rewards and puniſhments, and the nature of moral conſcience.—2. In the ſecond part of the ſyſtem, thoſe general principles are applied to the different ſtates, relations and conditions of man, comprehending (a) Ethics, or our duties to God, ourſelves, and others; (b) Natural Juriſprudence; laying down the principles of perfect and imperfect rights—the perfect obligation we owe to others, not to do an injury—to give every one his due, &c.—the natural rights of war, their nature and extent—all theſe rights in a well-regulated ſtate are lodged with and exerciſed by government. *Rights in Things:* rights of property, commonry, uſe, uſufruct, and the modes of acquiring thoſe rights, by occupancy, pact, or law; natural rights of inheritance. *Rights of Perſons:* ſlavery unnatural—the univerſal law of ſociety—ſubordination of ſocieties—civil ſociety—parental and domeſtic ſocieties. *Civil Government:* fundamental law of civil government—citizens, rulers, and the ruled—rights of ſovereignty explained and exemplified—duties and obligations of citizens

numerous as could be expected, though, as it was not an undergraduate courſe, few of the Students on the College eſtabliſhment thought it worth their while to attend; the hearers conſiſting chiefly of the Students of Phyſic.

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reſpect to government—their rights—different forms and qualities of government—diſtribution and powers in limited governments—ideas of conſtitution, convention, and final determination of the concerns of a limited government—rights of ſovereignty naturally limited, and deſpotiſm naturally unlawful.—3. *The Law of Nations*, as founded in nature, make the third part: law of peace, defence, war, and neutrality—the natural rights of national intercourſe—treaties of peace, alliance, armiſtice, ſponſions, &c.—national rights of territory and juriſdiction. Of this courſe the Profeſſor has publiſhed an ample text-book.

3. The Profeſſorſhip of Mathematics is at preſent held by JOHN KEMP, LL. D.

The firſt Mathematical claſs are taught arithmetic in a ſcientific manner, and algebra as far as quadratic equations.

The ſecond claſs ſtudy the elements of Euclid, trigonometry, the application of trigonometry to the menſuration of heights and diſtances, of ſurfaces and ſolids, land ſurveying and navigation.

The third claſs ſtudy conic ſections, the doctrine of the ſphere and cylinder, the projection of the ſphere, ſpherical trigonometry, the higher branches of algebra, the doctrine of chances and annuities, the application of algebra to geometry, and the doctrine of fluctions.

There is alſo a Profeſſorſhip of Natural Philoſophy and Aſtronomy in the College. This courſe is divided by JOHN KEMP, LL. D. the Profeſſor, into, 1. Mechanics, ſtrictly ſo called; 2. Hydroſtatics; 3. Hydraulics; 4. Pneumatics; 5. Optics; 6. Electricity; 7. Magnetiſm; and, 8. Aſtronomy.

But although they have conſtituted a Profeſſorſhip, and appointed a Profeſſor, there are two things wanting to give proper aid to the buſineſs. The firſt is an augmentation of Salary, and its permanency. 2dly, A Botanic Garden. A

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The different objects which belong to theſe heads, are minutely treated in a ſet of lectures which commence in the beginning of June, and continue daily until the firſt of April in each year.

The College is provided with an elegant and extenſive apparatus for Mechanical Philoſophy and Aſtronomy. There are about ſix hundred experiments performed each year during the courſe.—Young gentlemen may attend any or all of the Mathematical claſſes, as well as the Natural Philoſophy and Aſtronomical claſs, without regularly entering the College, or being ſubjected to any other regulations of the College than relate to thoſe claſſes reſpectively.

A complete Syllabus of this courſe is ready for the preſs, and will be publiſhed as ſoon as poſſible.

4. The Profeſſor of the Greek and Latin languages is the Rev. ELIJAH D. RATTOONE, A. M. Under him the Freſhmen claſs read, in Greek, Lucian, and a part of Xenophon; in Latin, Livy and the more difficult orations of Cicero; and every day either recite, with their other leſſons, a part of Greek or Latin grammar, or write Latin, or tranſlate Latin into free and elegant Engliſh.

The Sophomore claſs finiſh Xenophon, and read the orations of Demoſthenes, the odes of Horace, and part of his ſatires.

The Junior claſs finiſh Horace and read Homer.

The Senior read Longinus and Cicero De Oratore and De Officiis.

Salary allowed for five years only, leaves the perſon who receives it in doubt as to it's continuance beyond that time; and of courſe draws off his attention to ſome other buſineſs or purſuit; and when that compenſation ſo limited is even

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In the lower claſſes, the chief attention is paid to make the pupils well verſed in grammar, and the firſt principles of language; at the ſame time care is taken to explain the difficulties, and point out the excellencies of the ſeveral authors.

In the higher claſſes, as they are now acquainted with the rudiments of language, though they are not even now neglected, the ſtudents are inſtructed in the art of ſcanning, in ancient geography and hiſtory. The different forms and figures of ſpeech are noticed, and comments made on the ſentiments and beauties of the authors—parallel ſentences quoted—particular idioms obſerved—and all alluſions to diſtant cuſtoms and manners explained.

On May 7, 1794, a Profeſſorſhip of humanity was eſtabliſhed, and Lectures are delivered by Mr. Rattoone, in a regular courſe, on humanity; including the opinions of the ancient philoſophers; the religion, government, laws, policy, cuſtoms and manners of Greece and Rome; the whole deſigned to explain and elucidate ancient learning, and to facilitate the acquiſition of liberal knowledge.

In ſhort, the object purſued is to make critical and uſeful ſcholars—to infuſe, from thoſe learned languages, a true taſte for propriety and correctneſs—to teach the value of thoſe tongues which never change nor vary, which the Profeſſor conſiders as the true ſtandards of excellence in language, and as containing generally whatever is juſt in thought, elegant in expreſſion, and harmonious in numbers.

5. John Christoff Kunze, S. T. D. is the Profeſſor of Oriental Languages, and aſſiſts the Students of Divinity, of all denominations, in their purſuits to acquire a competent knowledge of the original language of ſuch documents of revealed religion

while it laſts, too ſmall at the ſame time for a man to be comfortable upon, he becomes neceſſitated to employ much of his attention upon other buſineſs immediately connected with his ſubſiſtence; ſo that having neither a ſufficient

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as belong to the Old Teſtament. He teaches the graduates and under-graduates of Columbia College, and others who apply for the purpoſe, at ſuch hours as do not interfere with the uſual lecture hours of the College. He endeavours to lead his ſcholars ſo far in *one year*, as to enable them to come, by cloſe application to books and private induſtry, to any degree of improvement without the further oral aid of a teacher; though he offers to all ſuch as will attend him a ſecond year, to read, at a particular hour, one or more of the moſt difficult books of the Bible with them; as alſo to acquaint them with principles of the related languages, the Arabic, Syriac, and Chaldaic, which he conſiders as highly *uſeful*, and to a divine, whoſe theological knowledge aims at ſomething more than what is commenſurate with the general ſtandard of country miniſters, as *neceſſary* and *eſſential*.

The Profeſſor only expects, that for ſuch an additional hour, a competent number will apply to conſtitute a claſs; but for teaching the principles, he conſiders his appointment as obligatory to admit an individual.

As he found it difficult to procure a printed grammar in ſufficient numbers in this country, and the uſe of different grammars would retard the progreſs of the ſtudents, he has brought all that is neceſſary and eſſential into the ſmall compaſs of four ſheets, of which each of his hearers, by degrees, takes a copy; and he flatters himſelf, that his method hitherto has proved more compendious and more advantageous than that generally purſued. Only a few of the principal rules are to be gotten by heart, and the reſt are rendered familiar by the practice.

He connects, from the beginning to the end, the practical exerciſes of *reading* and *analyzing*, with the explanation of the principles; for which purpoſe he chooſes the *Pſalms*

compenſation, nor a proſpect of its continuance, it cannot be expected he will purſue the objects of his Profeſſorſhip with entire zeal and aſſiduity.

The eſtabliſhment of a Garden is nearly connected with the Profeſſorſhip of Botany under the College, and the

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*of David*, out of which he ſelects thoſe verſes which contain all the words occurring in them; which verſes amount to no more than 564, according to Opitius and Bythner; and he gives all the words for every taſk, with which the memory is to be impreſſed. The number of taſks of the grammar, as well as the practical exerciſes deſcribed, amounts to 130. Did the ſtudents regularly attend, to complete the whole, twenty-ſix weeks would be required, allowing five hours to a week; but experience has taught, that the courſe commonly runs through the year. The time hitherto found moſt ſuitable, is every day, Saturday and Sunday excepted, from twelve to one; the place, the Profeſſor's houſe; and the commencement of the lecture, the end of the ſpring vacation in June.

6. A Profeſſorſhip of *Economies* was inſtituted in July, 1792, and SAMUEL LATHAM MITCHILL, M. D. appointed Profeſſor. This courſe, of which a Syllabus is publiſhed, is conducted upon the *new French* ſyſtem. A few weeks ago, Mr. Mitchill gave an edition of the new Nomenclature of Chemiſtry, in French, German, and Engliſh, for the uſe of the ſtudents. This Profeſſorſhip compriſes not only the claſſification and arrangement of natural bodies, but alſo treats of a great variety of facts which form the baſis of Medicine, Agriculture, and other uſeful arts, as well as of manufactures.

This courſe, which it is neceſſary for Students of Phyſic to attend, begins after the autumnal vacation, and ends in the ſpring, about the time the Medical Lectures are concluded. Any gentleman who wiſhes to ſtudy Chemiſtry may attend this claſs, without regularly entering College, or performing the taſks required from ſtudents on the eſtabliſhment. There is a handſome apparatus belonging to this department, and a conſiderable collection of foſſils.

7. The Profeſſorſhip of the *French Tongue* is held by ANTOINNE VILETTE MARCELLIN. A good pronounciation being very eſſential in every living language, the beginners are

Lectures on that branch muſt be always very lame and defective without one. Nothing but a more full conviction of its importance and utility, is wanting to ſet on foot ſuch an Inſtitution, and to carry it into effect. A Botanic Garden

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particularly inſtructed in this, and when this is ſufficiently acquired, they are gradually made acquainted with the different parts of ſpeech, which are explained to them in a clear and conciſe manner, by the aid of the beſt grammars, founded on the deciſions of the French Academy. Theſe things being underſtood, they are put to the exerciſes correſponding to the rules they have learned, and tranſlate, in the mean time, the French books beſt adapted to their proficiency and capacities, into Engliſh. When they become capable of rendering them with eaſe and elegance, and have acquired a due knowledge of the rules of French ſyntax, they are taught an eaſy phraſeology, and made to tranſlate Engliſh into French with propriety, particularly paſſages of the beſt Engliſh authors. They are then made acquainted with the beſt French authors, both in verſe and proſe. The courſe of French tuition begins about the middle of June, and ends in April. Though particularly deſtined for the ſtudents of Columbia College, other perſons are likewiſe allowed to attend.

8. A Profeſſorſhip of Law was inſtituted in December, 1793, and JAMES KENT, A.M. appointed Profeſſor. Mr. Kent having been ſo recently appointed, has not as yet entered upon a courſe of lectures, but this Profeſſorſhip is intended to compriſe a brief review of the hiſtory, the nature, the ſeveral forms, and the juſt ends of civil government—a ſketch of the origin, progreſs, and final ſettlement of the government of the United States—a particular detail of the organization and duties of the ſeveral departments of the general government, together with an examination of ſuch parts of the civil and criminal codes of the federal juriſprudence as ſhall be moſt ſuſceptible of illuſtration, and moſt conducive to public utility. The conſtitutions of the ſeveral ſtates, and the connection they bear with the general government, will then be conſidered, and the more particular examination of the conſtitution of this ſtate. The whole detail of our

is not only one of the genteeleſt and moſt beautiful of public improvements; but it alſo compriſes within a ſmall compaſs, the Hiſtory of the Vegetable Species of our own Country;

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municipal law, with relation to the rights of property and of perſons, and the forms of adminiſtering juſtice, both civil and criminal, will then be treated fully and at large.

II. Under the Faculty of Phyſic:

1. The Dean of the Faculty, SAMUEL BARD, M. D. is Lecturer on Clinical Medicine in the New-York Hoſpital. The objects of this courſe are all ſuch medical caſes occurring in the Hoſpital, which, from their nature or importance, are more particularly worthy the attention of the ſtudents. Theſe being in the firſt place ſelected by the teacher, who is alſo one of the Phyſicians of the Charity, are viſited and attended with regularity, examined publicly before the ſtudents, and the ſymptoms, preſcriptions and daily alterations recorded. Theſe in due time become the ſubjects of lectures, in which the characteriſtic ſigns of diſeaſes, the indications of cure, the effects of remedies, and every other circumſtance of importance, are diſcuſſed; for which uſeful purpoſe the Hoſpital affords a ſufficient number of intereſting caſes; and although a different corporation from that of the College, is regulated and governed in ſuch a way as to further the inſtructive views and purpoſes of the College in the completeſt manner.

2. Botany is here a diſtinct branch of ſtudy, and the Profeſſor is SAMUEL LATHAM MITCHILL, M. D. In this courſe, beſides the diſcuſſion of the Linnæan or ſexual ſyſtem, the explanation of terms and phraſes, and the arrangement or claſſification of the vegetable ſpecies, an attempt is made by the Profeſſor, who is a practical farmer, to elucidate and explain the economy of plants, their affinity to animals, and their organization, excitability, ſtimuli, life, diſeaſes, and death of both claſſes of beings. The phyſiology of plants, including their food, nouriſhment, growth, reſpiration, perſpiration, germination, &c. is therefore particularly enlarged upon, as connected with GARDENING and FARMING This is a ſummer courſe.

and by the introduction of Exotics, makes us acquainted with the plants of the moſt diſtant parts of the earth. Likewiſe, by facilitating experiments upon plants at this time, when a true Theory of Nutrition and Manures is ſuch an intereſting

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3. The Anatomical chair is filled by Profeſſor WRIGHT POST. He commences with a compendious Hiſtory of Anatomy, from the earlieſt ages to the preſent period; after which, the firſt object is to take a general view of the principal materials of which the body is compoſed; endeavouring to explain the uſe of each, and the manner of connection, ſo as to give a general idea of the animal economy: he then proceeds, with more accuracy, to the more particular branches of anatomy, by firſt explaining the ſtructure of the different organs, and afterwards inveſtigating their functions. In proſecuting this inquiry, the body is divided into the following ſyſtems: 1. the Oſſeous; 2. Muſcular; 3. Vaſcular; 4. Chylopoetic; 5. Secretory; 6. Nervous; 7. Reſpiratory; 8. Connecting and Communicating; 9. Defenſive; 10. Genital. Under one or other of theſe heads, every part of the human body may be naturally arranged; and this diviſion is preferred to the one in common uſe, as being equally expreſſive and more comprehenſive.

The ſtructure and functions of the different organs in their natural ſtate being underſtood, an attempt is made to explain the changes they undergo by diſeaſe. In this inveſtigation, it is not conſidered ſufficient barely to mention the appearances which are exhibited upon diſſection, and to explain the manner of their production, which, ſtrictly ſpeaking, would be all that Pathology implies, but alſo to point out the ſymptoms which characteriſe each individual diſeaſe, and recommend ſuch treatment as, from experience, has been found moſt beneficial. This is not all: through all the lectures, a conſtant application of the knowledge acquired in anatomy is kept in view, as conducive to the cure of diſeaſes, eſpecially ſuch as require MANUAL OPERATION. So that a courſe of Anatomy, as taught in Columbia College, has incorporated with it, a ſyſtem of the THEORY AND PRACTICE OF SURGERY.

deſideratum, a Botanic Garden may be conſidered as one of the means of affording ſubſtantial help to the labours of the Agricultural Society, and be conducive to the improvement of modern huſbandry. When theſe things

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It may not be unintereſting to ſome to be informed, of the particular advantages which the School of Anatomy in Columbia College affords. The Profeſſor has been at conſiderable pains to eſtabliſh an Anatomical Muſeum, and for this purpoſe he has made two viſits to Europe; the laſt expreſsly to collect anatomical preparations; and what a twelvemonth of labour and induſtry could obtain, is now exhibited in Columbia College. In this collection, the intimate ſtructure of all the important organs in the body is made manifeſt and conſpicuous; ſo that where deſcription fails to give clear conceptions, the eye makes up the deficiency, and communicates to the mind a juſt and accurate knowledge. The advantages of preparations in a courſe of anatomical lectures are ſo obvious, that any obſervations tending to ſhow their utility are quite unneceſſary. It is ſufficient to add, that without ſuch aid it is impoſſible for any teacher to convey preciſe ideas of the ſtructure of the animal body.

4. The Obſtetric Branch, of which JOHN R. B. RODGERS, M. D. is Profeſſor, comprehends the Phyſiology and Pathology of Parturition. The Profeſſor gives an anatomical deſcription of ſuch parts as are neceſſary to the conſideration of his ſubject, and explains the diſeaſes to which they are incident, as well as the general diſeaſes of the female ſyſtem. He recites the various complaints of pregnancy, and the means of alleviating them. The varieties of parturition are detailed, and exemplified by machinery, as well as in practice. The diſeaſes of the child-bed ſtate are accurately treated of, together with the management of women at that time.

The laſt part of the courſe comprehends not only the diſeaſes to which children are ſubject *in the month*, but alſo thoſe which moſt generally affect them in the firſt years of their lives. The Obſtetric courſe, in ſhort, gives a conſiderable view of Phyſiology, and takes in an extenſive range of the Practice of Phyſic.

are duly conſidered, it can ſcarcely be doubted, that a Botanic Garden, under the direction of the Society, or of the College, with a view to further the agricultural intereſt, will be

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The utility of ſuch a courſe is obvious to all, and eſpecially ſerviceable to medical ſtudents from the country, who muſt neceſſarily be often called on to practice midwifery, and ought therefore to be well acquainted with this branch of education.

5. WILLIAM PITT SMITH, the Profeſſor of Materia Medica, conſiders the ſubjects of his courſe under two general diviſions, viz. PHARMACEUTICAL and THERAPEUTICAL. Under the firſt of theſe diviſions, rules are given in reſpect to the manner in which ſubſtances are to be prepared, preſerved and combined ſo as to render their application moſt convenient and ſalutary; and under the ſecond, doctrines are delivered reſpecting the medicinal nature of ſubſtances and powers that are happily applied to the human body in anſwer to ſome indication of cure. Theſe are conſidered as either *Mechanical*, *Chemical*, or *Phyſiological*. The mechanical powers are principally referable to Surgery. The operation of chemical powers on the human body is explained on the principles of Lavoiſier, Beddoes, Girtanner, &c. Phyſiological powers are claſſed by the Profeſſor under the terms of *Stimulantia* and *Sedativa*.

Theſe claſſes are ſubdivided into certain orders and genera; and the actions of all ſuch powers are conſidered not only as either *direct* or *indirect*, but as, in general, peculiarly referable to ſome one of the various ſyſtems of which the human body is compoſed. This, as well as the Botany, is a ſummer courſe.

6. The Profeſſorſhip of the Inſtitutes of Medicine is held by WILLIAM HAMMERSLEY, M. D. In his courſe of lectures he treats of the different functions of the living body in health, and of the changes they undergo in diſeaſes. He endeavours to explain the operation of natural cauſes, and of civil inſtitutions upon the human ſyſtem, and by theſe means to account for the variety of diſeaſes incident to different climates and to different ſtates of ſociety. He conſiders all animal bodies as ultimately compoſed of a ſimilar matter, and from the various modifications and texture of this matter, not only

ſet on foot and ſupported by Legiſlative proviſion; to the end that young minds be early imbued with proper ideas on this important ſubject.

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in different animals, but in different parts of the ſame animal, to explain the various uſes to which different parts are deſtined. He endeavours to explain the phænomena of the nervous ſyſtem, (to which the living principle is attached) to inveſtigate the laws which regulate it, and the various conditions of it in diſeaſe. This leads him to the conſideration of the mutual influence of mind and body on each other, and of the cauſes of the different degrees of intellectual power obſervable in different individuals. He then treats of the nature and properties of the blood; of the circulation; of reſpiration; and of their connection with the production of heat, and with the formation of the voice, ſpeech, &c. After the conſideration of theſe, he treats of the digeſtion of the food, its aſſimilation into blood; and laſtly, of the properties of the different fluids ſecreted into different cavities, to ſerve various purpoſes in the animal economy.

7. Surgery is taught by Profeſſor Richard Bayley; and

8. Samuel Nicoll, M. D. is Profeſſor of the Practice of Phyſic.

# ADDRESS

TO THE

# SOCIETY,

*In conſequence of their Requeſt, during the Abſence of Mr. Juſtice* HOBART, *who had been appointed to deliver the Annual Oration.*

By ROBERT R. LIVINGSTON, Esq. President.

AN Honorable Member having long ſince been requeſted to deliver an Oration to the Society, it is not without regret that I reflect on the circumſtances that have hitherto prevented his executing that duty; his experience and agricultural knowledge would have given us reaſon to hope for much intereſting and uſeful information, which will be illy ſupplied by the haſty production which in obedience to this late command, I now ſubmit to the ſociety.

It will not be expected, I preſume, that I ſhould long detain your attention by a lengthened panegyric upon agriculture, ſince you have ſhewn the opinion you entertain of its importance, in the very act of becoming members of a ſociety whoſe object it is to improve and extend this uſeful ſcience.

As Agriculture is the baſis of Arts, by furniſhing the materials upon which they work, ſo it is the parent of ſcience, by uniting men in civil ſociety, who without its aid would have continued to be wandering ſavages, but little advanced in improvement beyond the beaſts of the foreſt that afforded them a miſerable and ſcanty ſubſiſtance. It is for this reaſon that the Mythology of moſt nations have made their golden age conſiſt in the enjoyment of rural happineſs, and placed the inventors of agricultural improvements among the number of their Gods: Thus Ceres, Pan, Pomona, &c. were worſhipped under different names by all the civilized nations of the Pagan World. And our own holy Religion teaches us that the cultivation of a garden, and the enjoyment of its fruits and flowers, were the employment and reward of innocence when man was moſt perfect. It is a little remarkable that innocence and reaſon ſtill concur in receiving pleaſure from the ſame object. The firſt wiſh of childhood is rural happineſs, nor is that ever loſt ſight of, except where ſome turbulent and reſiſtleſs paſſion depraves and hurries away the ſoul. In every period of life it animates virtuous and ingenuous minds. The idea of a rural retreat in the evening of his days, accompanies the Mechanic to his ſhop, the Merchant to the exchange, the Lawyer to the bar, the Phyſician to the ſick bed, and the Divine to the pulpit, who ſees, even there, his earthly paradiſe upon the confines of heaven, and hardly wiſhes to enter the

celeſtial manſions by any other path. How much then is it to be lamented that indolence or purſuits of little moment, withdraw the attention of men whoſe lights, whoſe talents for obſervation, and whoſe fortunes enable them to be uſeful not only to the community of which they are members, but to mankind at large, not to their cotemporaries only, but to future generations:—One great cauſe of the neglect of Agriculture in men of the character I have mentioned, is a miſplaced ambition which generally ſeizes upon them at the very period of life at which they are beſt fitted for agricultural purſuits. Youth has too many avocations, and is too unſteady to purſue the ſlow progreſs of experiments, and the decrepitude of old age deprives it of the ſtrength and activity neceſſary in rural œconomy; it is the ſeaſon of life in which we may enjoy the ſedate pleaſures of the country, but not undergo its toils. The middle age, when the effervescence of youth is over, when the body retains its ſtrength, and the mind enjoys its greateſt vigour, is the period beſt adapted to the uſeful labours of Agriculture; but unfortunately this is alſo the age of ambition which hurries us away from the peaceful path, where every ſtep is ſtrewed with flowers, to loſe ourſelves in the endleſs mazes of politics. And yet if ambition is the love of fame, how much are we deceived by purſuing it in this rough and thorny track? The little politics of our town,

our county, or even of our ſtate, are mere matters of a day; and however important they may ſeem in our eyes, while we are ourſelves the actors on this buſy ſtage, they will appear to others of too little moment to arreſt their attention.—Our fathers were politicians, their fathers were politicians, and yet we hardly know the parts they ſeverally acted, or even the names or principles of the parties they oppoſed or ſupported. In like manner the intriguing politicians, and the wordy orators of the preſent day will be buried with their principles and their parties in eternal oblivion, when the man who has introduced a new plant, or eradicated a deſtructive weed, who has taught us to improve our domeſtic animals, or to guard againſt the ravages of noxious inſects—who has invented a new implement of huſbandry, or ſimply determined the angle the mould-board ſhould make with plough-ſhare, will be remembered with gratitude as the benefactor of ſociety.

It is the politician's misfortune to believe that every thing is wrong which he does not direct, and that the ruin or welfare of the State depends upon the adoption of his principles; and yet the world was governed before he was born, and will be ſo well directed after his death, that his preſent political exiſtence will hardly be remembered one week after his funeral. As the purſuit of fame by the road of politics, requires infinitely more talents than falls to the

ſhare of the great bulk of mankind, and great epochs or extraordinary circumſtances to call thoſe talents into action, but very few can hope for political fame, while their purſuits have a direct tendency to injure the fineſt feelings of the mind, and to add poignancy to the moſt painful paſſions.

The thorough-paced party-politician concurs in many meaſures that he does not approve, he confides in men that he ſecretly deſpiſes—he oppoſes the meaſures of his antagoniſt, though his reaſon tells him they are proper—His ſins of omiſſion and commiſſion daily ſtare him in the face, and if ever he finds time to pray, he muſt confeſs in the words of the Common Prayer, "That *he has done thoſe things which he ought not to have done, and left undone thoſe things which he ought to have done;*" while with a diſtruſtful eye he is compelled to guard againſt the defection of his partizans, he indulges the moſt rancorous reſentment againſt his antagoniſts: thus, jealouſy and hatred, thoſe painful paſſions, are nouriſhed like the vulture that feeds on the liver of Prometheus, to prey on his vitals. Rural life is exempt from theſe evils. The huſbandman hates no one, becauſe he dreads no rival. If his neighbour's field is more productive than his own, he borrows a uſeful leſſon, and turns his proſperity to his own advantage: Two important maxims are ever in his mind—Firſt, that the earth yields nothing to the idle and the negligent—Second, that though labour will do much, yet the

return it meets will often depend upon circumſtances which it is not in his power to command—He is therefore at once ſatisfied with the neceſſity of uſing the *means*, as the divines ſay, and of his dependance on the Supreme Being for crowning them with ſucceſs; thus reconciling (at leaſt in an earthly ſenſe) the intricate doctrines of *works* and *grace*. The conſtant attention that the farmer is compelled to give to the wants of his domeſtics, and to the animals under his care, render him habitually compaſſionate, humane and careful; and, if happineſs is to be found on earth, it muſt certainly be ſought in the indulgence of theſe benign emotions.—As Cicero ſums up all humane knowledge in the character of a perfect orator, ſo we might with much more propriety claim every virtue, and embrace every ſcience, when we draw that of an accompliſhed farmer.—He is the legiſlator of an extenſive family, and not only men, but the brute creation, are ſubjected to his laws—He is the magiſtrate who expounds and carries thoſe laws into execution—He is the phyſician who heals their wounds, and cures the diſeaſes of his various patients—He is the divine who ſtudies and inforces the precepts of reaſon—And he is the grand Almoner of the Creator, who is continually diſpenſing his bounties not only to his fellow mortals, but *to the fowls of the air, and the beaſts of the field.*

I was led into theſe reflections by finding myſelf ſurrounded by gentlemen who are not leſs capable of rendering their

country ſervices in the promotion of agriculture and uſeful arts, than in their reſpective political ſtations.—I wiſhed to convince them that at leaſt, as much reputation, with more permanent fame, might be acquired in the firſt than in the laſt of theſe purſuits; and yet to the diſgrace of this State it has ſo happened, that though it has always poſſeſſed men of diſtinguiſhed talents, the rage for party politics and diſſipation, have defeated every attempt to eſtabliſh any ſociety for the promotion of arts, agriculture, or any literary or ſcientific object: how many now hear me who are capable of wiping off this reproach—who have ample means of doing honour to the State, by promoting that of this Society, but who have yet offered it no aid! The exertions of a few friends to uſeful knowledge, have enabled us to ſtruggle through three years: And I would fain hope that many now preſent will ſtep forward to our future ſupport.

I proceed to diſcuſs the ſubject which I particularly deſigned to ſubmit to the conſideration of the Society; I mean the compariſon between the advantages of agriculture in Britain, and in this State. I am well aſſured that falſe conceptions on this ſubject have led many theoretical farmers into important errors. The inhabitants of every part of the world (our own excepted) entertain ſtrong prejudices in favour of their native country: here, on the contrary, the people are habitually led to form exalted ideas of Britain, and degrading ones of America.—I

do not remember that this ſingular circumſtance has been obſerved or accounted for. The ſettlers of this country conſiſted originally of emigrants from various parts of Europe, but principally from the Britiſh iſles. Though their practice ſhewed their preference, yet they could not diveſt themſelves of this prejudice in favour of their native country. And that prejudice, as was natural, was increaſed by the diſtance and the hardſhips to which their change of ſituation expoſed them; it was ſtimulated into exerciſe by the vanity of raiſing themſelves above their neighbours, for every man ſuppoſes he borrows a certain degree of conſequence from the ſuperiority of his country. Thus an Iriſh, a Dutch, and a Britiſh emigrant, ſettled in the neighbourhood of each other, would boaſt the ſuperiority of their reſpective countries; would conceal their defects, and exaggerate their advantages; and diſagreeing in every thing elſe, would unite in admitting the inferiority of America to Europe, that tie which connected them with each other; their children and neighbours having no means to contradict explicitly, credited theſe tales, and felt themſelves inferior to theſe boaſting natives of a diſtant land; their deſcendants endeavoured to ſhare in the honour of their parents, by recording their deſcent from ſuch illuſtrious anceſtors; and gloried in diſſeminating falſe ideas of countries of which they had no other knowledge except through this ſource, and from other boaſting and conſequential travellers.—It is

true, theſe prejudices are wearing off, yet there are few perſons who do not even now conſider the ſoil and climate of Britain as ſuperior to that of this State, when the fact is directly the reverſe. The proportion of land unfit for cultivation in the iſland of Great Britain, is much greater in compariſon to the whole quantity, than it is in this State—The ſoil is leſs productive, except where great labours are beſtowed in cultivation; and the climate in many reſpects leſs friendly to agriculture. I aſſert this from a careful examination of the beſt Engliſh writers on the ſubject, and particularly from Young and Marſhal, who are much better authority than the aſſertions of emigrants, that for the moſt part have given little attention to the ſubject, or judge of the whole kingdom from a fertile or highly cultivated ſpot in their neighbourhood.

Let us now deſcend to particulars, and candidly weigh its advantages and diſadvantages—The firſt advantage England poſſeſſes, conſiſts in her early ſpring; this enables the farmer to commence his work ſooner than he can in this country: to this cauſe it is owing that ſuch crops as require early ſowing on a well prepared fallow, ſucceed better in Britain than here. Barley, for inſtance, requires at leaſt four good ſpring ploughings, and yet ſhould be put in by the firſt of May: this cannot be done here except upon very light lands, our clays being hardly fit to plough before May; but light land will not produce good barley without manure. In England it may be raiſed

to advantage on ſtrong loams, and even on clay. It is for this reaſon that barley is nearly as cheap in England as here, though every other grain is 60 per cent dearer than in America —The ſame reaſoning applies to beans which are unproductive in England, unleſs ſown in February and March, which is hardly poſſible here on ſtrong clays, the ſoil theſe require. Turnips cannot be raiſed in our climate to advantage, as a food for cattle: the ſeaſon in which they are ſown being uſually very dry, and the plants liable to be deſtroyed by the fly. Great Britain has alſo ſome advantage over us in the ſhortneſs of the winter, but much leſs than is generally imagined. Their Autumn is cold and wet, and though there is ſome apparent verdure, yet the vegetation is ſo ſlow, as to render it uſual for good farmers to houſe their cattle by the firſt of November, rather than ſuffer them to poach their fields in gleaning a ſcanty ſubſiſtance from them; nor do they turn them to paſture till late in April.

Theſe are, I believe, all the advantages that the Britiſh farmers fairly claim over us. Let us now examine thoſe we excluſively poſſeſs: The nobleſt of theſe is the *maize* or Indian corn; neither the beans or turnips of Britain can be compared to this plant: Firſt, it need not be planted till the laſt of May, ſo that the farmer is never hurried by it with his ſpring-work: Second, it is cultivated with a plough or horſe-hoe; and as the plants are large, and placed at five feet diſtance, there is ample room for this; and though it

is alſo uſual to hand hoe; yet as this is done after the ground is looſened by the plough, and when the plant is a foot high, and then only juſt about the ſtem, it is eaſier to hoe ten acres of this than one of the turnips or beans: Third, it defies the drought, and never fails to make ample returns to the huſbandman that cultivates it with diligence; forty buſhels an acre being a common yield when well tended; and from ſixty to ſeventy, in a good ſoil, and in the beſt ſtate of cultivation. The grain furniſhes a palatable and nutritious food for man, and is greatly ſuperior to any foreign ſpecies for farm ſtock—and while bean-haulm is of little value, the tops and blades of maize are not inferior, if gathered in ſeaſon, to the beſt hay; and as this crop is eaſily and neceſſarily kept clean, it is the beſt of all fallow crops. The writers on agriculture in England, are conſtantly recommending horſe hoed crops inſtead of fallow: but neither precept nor example have been able to overcome the reluctance the great bulk of farmers feel to ſubmit to this expence, for crops ſo little profitable, and requiring ſo much labour if hoed, as either beans or turnips—while maize has, by its ſuperior excellence, and the facility with which it is effected, rendered the practice univerſal here, and I believe I ſpeak within bounds when I ſay, that the whole iſland of Britain has fewer acres cultivated with the horſe hoe, than we have in this ſtate alone—The want of turnips may be amply compenſated by carrots which

may be raiſed at leſs expence here than in Britain, becauſe we have much fewer weeds, which are the greateſt enemies to that root; by cabbages and potatoes, which grow well here; and by pumpkins, which are raiſed in very conſiderable quantities in our Indian corn fields, without any other expence than that of dropping a few ſeeds in the hills, and carting the crop—Nor can I help recommending them as a rich and nutritious food that will ſave two month's hay, if uſed in the beginning of the winter, and afford milk and butter equal in quantity and quality to the product of the richeſt paſture—Theſe legumens would not be ſo much neglected here as they generally are, were it not that hay is made in this country at half the expence that it requires in the moiſt climate of Britain: Vegetation there is extremely ſlow; their ſpring is nearly one month earlier than our's; yet though their wheat begins to grow in March, it is not reaped till late in Auguſt—our's is cut ſix weeks earlier, though it does not begin to vegetate till late in April: So that it takes five and one half months in Britain to perfect a crop which is performed here in little better than three. The ſame cauſes influence the growth of graſs—In ſoils therefore of equal quality, much leſs will grow in a given time in Britain than in America, as I infer from the general average of their clover and natural graſs in not exceeding ours, though they are longer in a growing ſtate. It is true, that the moiſture of the climate, and mild winters,

give a great verdure to their fields at ſome ſeaſons; but this is only an apparent advantage, which deceives ſuperficial obſervers, while it is attended with real inconveniencies: Firſt, the graſs itſelf is by that circumſtance rendered leſs nutritious, as is well known by every farmer: Second, while the hay is lighter, it is got in at more expence than ours, which is made at the drieſt ſeaſon of the year—In our crops of grain we enjoy ſimilar advantages; their harveſts are frequently wet, while nine years in ten ours is got in without the leaſt obſtruction from rain—The produce would alſo, I am well ſatisfied, be greater here than in England on highly cultivated ſoils, ſince it is well known that the ſtrength of the ſtraw depends upon the dryneſs of the ſeaſon. In a moiſt climate, therefore, without ſufficient ſun to harden the ſtraw, heavy crops muſt be very often injured by lodging—eſpecially if we take into conſideration, that high winds are much more uſual in Great Britain than here—Blight and mildew are effects of a moiſt climate; theſe are ſeldom and partially known in this State, prevailing only in particular diſtricts in extraordinary ſeaſons. In Britain it often happens, that wet weather, when the wheat is in bloſſom, affects all the wheat in the kingdom, many parts of which, on this account, do not pretend to raiſe it.

If vegetation is ſlower in Britain than here, and if the graſs is alſo leſs nutritious, it muſt follow, that with the ſame

attention to ſtock our paſtures with the beſt graſs, and to keep the cattle out of them at improper ſeaſons, a larger ſtock may be maintained on the ſame quantity of ground in this State, than in England; and thus the difference in the length of our winter be amply compenſated. This obſervation leads me to a circumſtance in Britiſh huſbandry, which might be advantageouſly practiſed by us—Many of their farmers ſow rye for the uſe of their ſheep and lambs in the ſpring; in order to this they muſt be at the expence of a fallow, and as their rye grows two fifths ſlower than ours, it muſt follow that they can only keep three ſheep, where we may have five. If therefore this practice is advantageous in England, it would be much more ſo in America, to ſow our corn fields with rye, to feed off with ſheep in the ſpring, not only becauſe of the additional numbers that we can keep, but becauſe we are more pinched for ſheep-food in the ſpring; beſides that the rye that coſts the Britiſh farmer a complete fallow, coſts us nothing but the ſeed, if ſown among the corn when it is topped; and as five ſheep will leave more manure than three, the rye field ſo fed down, will be left in better order here by this practice, than it would in Britain.—In the healthfulneſs of our ſtock we have alſo great advantages over Britain. Among our black cattle I have been told that ſome diſorders prevail, though they are ſo extremely rare, that in twenty years ſince I commenced farming, I do not recollect to have

loſt one creature, unleſs it were by ſome accidental hurt: nor have I known any others to die among my neighbours, except from the ſame cauſe, or bad keeping in the ſpring: and while the rot ſweeps away whole flocks of ſheep in Britain, it is a diſorder intirely unknown in this country.

All theſe natural advantages being in favour of the American farmer, I ſhall be aſked how it happens that the lands in Britain are more productive: Admitting the fact, which however is not quite out of doubt, when the general average of the cultivated parts of both countries, are compared, the anſwer would be found in the low price of labour, and in the high price of land. More labour is therefore expended upon leſs land there, and the product is always in proportion to the labour, the ſoil and the climate. But does it yield more profit to the cultivator? —No man need be told that a garden where one man is conſtantly employed upon half an acre of ground, will produce more pulſe than the ſame quantity of ground cultivated with a plough, in which way one man can tend ten acres; but does it follow the one half acre is more profitable than the ten acres, even though the additional rent ſhould be ſuperadded? That huſbandry is more profitable here than in Britain, is evident from this ſingular circumſtance, that the labour is dearer, and lands proportionably worſe cultivated, yet the American farmer can afford to ſell his product 60 per cent cheaper than the Britiſh huſbandman—The reaſon is obvious:

In England a greater capital is neceſſary, even though labour is cheaper than in America, to render their lands equally productive, and the intereſt of their capital muſt be added to the price of the produce. In Britain the average of labour, when the labourer is lodged and fed, is below forty dollars a year, here it is above ſixty; and yet the American farmers can afford to ſell their product ſixty per cent cheaper than the Britiſh cultivator: Does it not follow then, that the ſame labour produces more by ſixty per cent, and the whole difference of the price of labour? And where the cultivator, as is the caſe with moſt of our farmers, is his own labourer, is not the difference in the price of labour to be conſidered as part of his profit, ſince he earns ſixty dollars where a Britiſh cultivator earns forty; and yet makes ſo much more from his land over and above this difference in the value of his own labour, as to underſell the Britiſh farmer even in his own market?

All theſe obſervations are intended to apply to lands in their common ſtate, not to lands on which a great capital has been expended in one country, and nothing in the other. Thus I do not mean to ſay that a bog meadow in America without a ditch, ſhall produce as much as a meadow reclaimed at a great expence in Britain; or that a piece of clay ground in England completely under-drained, will not produce more than a ſimilar piece here without a ſingle water-furrow: I know too that theſe improvements are much more uſual in

England than in America, where lands are cheap, and the farmers' capitals too ſmall for expenſive improvements: all I mean to ſhew is, that this country has natural advantages in its ſoil and climate over Britain, and to encourage our farmers to hope, that whenever their circumſtances ſhall enable them to circulate their artificial improvements, that agriculture will be carried to a much higher pitch here than in Britain: One of the cheapeſt and moſt obvious improvements, and to which England is more indebted than to any other, is the ſowing of graſs ſeeds, and particularly clover, and putting in their wheat upon a clover clay inſtead of an expenſive fallow. To this permit me to add another from my own experience, which is, the practicability of raiſing lucerne as eaſy here as in any part of the world: a plant which as much exceeds red clover, as the red does the common white; but which the want of ſun, and the moiſt climate of England generating an infinity of weeds, prevents their cultivating to any advantage —to theſe phyſical, every man's reflections will add thoſe moral advantages that ariſe from the enjoyment of freedom under the happieſt of conſtitutions; the equality of our fortunes, which facilitates our mutual intereſts; and the reſpect in which Agriculture is held by thoſe who govern and direct our affairs; where the Hero, the Patriot, the Stateſman, WASHINGTON, does not diſdain to guide, who can refuſe to venerate the Plough?

# EXPERIMENTS AND OBSERVATIONS ON LUCERNE:

*By the Hon. ROBERT R. LIVINGSTON,*

PRESIDENT OF THE CORPORATION.

## EXPERIMENT—No. I.

APRIL 20, 1791.—Mixed 2 lbs. of lucerne with 2 lbs. of clover ſeed, ſowed them with oats on $\frac{1}{4}$ of an acre of ground, the ſoil ſand to the depth of 14 feet, but in good order, having been the two preceding years in potatoes with dung.—6th April, 1792.—Spread two buſhels of gypſum.—May 25.—The clover very luxuriant; the lucerne, though of ſuperior height, branches ſo little, and is ſo compreſſed by the clover, as hardly to attract attention. About the middle of June, cut the graſs product in dry hay, a large load for two oxen, or ſomewhat more than half a ton.—Auguſt 8. Cut a ſecond crop, about 5 cwt. The ſummer having proved very dry, and the ſoil being naturally ſo, the clover did not riſe ſufficiently

to be cut, ſo that this crop conſiſted wholly of lucerne: I now experienced the want of ſeed, for though the lucerne was about 27 inches high, it occupied too little ſpace to produce a great crop. The lucerne and clover roſe after this cutting, and might have yielded a tolerable crop, but I preferred leaving the rowan to protect the roots againſt the winter winds. —1793, 1ſt April. Dreſſed this ſpot with one buſhel of gypſum.—28th April. The ſpring proving uncommonly early, the ground being naturally warm, having a ſouth aſpect, and the plants having been protected by a good winter coat. The lucerne exhibited a moſt beautiful appearance; it was 13 inches high, the clover growing with it not more than two. The common paſtures were barely green. As my hay was gone, and none to be purchaſed, (the year preceding having yielded but bad hay-crops) I was compelled to employ my lucerne to feeding four plough horſes, three times a day in the ſtable as they came from their work; and four ſows that had pigs, which were regularly fed with it three times a day; the horſes were turned out at night to glean what they could in the paſtures; it laſted them till the twenty-third of May, and what was laſt cut, was near three feet high.—10th June. Began again to cut for two very large coach-horſes, kept altogether in the ſtable; it laſted them to the twenty-eighth. In this cutting the clover amounted to near one half of the crop, which was I think more productive on that account

than the one that preceded, or thoſe that followed it.—On the 28th of July, mowed a third time for hay; the product as nearly as I could judge, about 6 cwt. dry. The clover aided this crop very little, the drought having prevented it from riſing much after the laſt cutting, and indeed a conſiderable part of it had dried out. As no clover appeared after this, and the lucerne was perfectly free from weeds, I conceived the idea of leaving it for ſeed; and did not therefore cut it when in bloſſom, as I might have done, and have had a fifth crop: the ſeeds were not ripe till the 1ſt of October, when it was again cut, and produced about 6 cwt. of dry hay. Though the ſeed looks fair and ripe, and promiſes to yield a conſiderable quantity, yet from not underſtanding the management, or from the lucerne's having been touched by the froſt, I have been able to make no hand of collecting it; perhaps after it has laid longer, it will be more eaſily ſeparated from the pod.

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EXPENCE PER ACRE OF THIS EXPERIMENT.— NO. I.

| | | | | |
|---|---|---|---|---|
| Ploughing, &c. charged to oats, | | | | |
| 16 lbs. clover and lucerne ſeed, at 1/3 | £. | 1 | 0 | 0 |
| Sowing and harrowing in, . . . . . | | | 3 | 0 |
| 8 buſhels gypſum, at 4/. . . . . | | 1 | 12 | 0 |
| 1ſt cutting, making, &c. . . . . | | 0 | 10 | 0 |
| 2d Do. . . . . | | | 8 | 0 |
| | | | 3 | 13 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 2d YEAR, 1793. | | | | 3 | 13 0 |
| 1ſt cutting and feeding . . . . | | 0 | 10 0 | | |
| 2d. Do. . . . . | | 0 | 10 0 | | |
| 3d. Do. and making into hay, &c. . | | 0 | 8 0 | | |
| 4th Do. Do. . . . . | | 0 | 8 0 | | |
| 4 buſhels of gypſum, at 4/ . . . | | 0 | 16 0 | | |
| | | | | 2 | 12 0 |
| Total expence per acre, . . . . . | | | | *L.* 6 | 5 0 |

PROFIT PER ACRE, 1792.

| | | | |
|---|---|---|---|
| 1ſt crop, 2 tons of hay, at 2/6 . . . | 5 | 0 | 0 |
| 2d crop, 1 ton of hay, . . . . . | 2 | 10 | 0 |

1793.

| | | | |
|---|---|---|---|
| 1ſt crop, invaluable, as neither hay or oats were to be got, valued at 2 t. hay, | 5 | 0 | 0 |
| 2d crop, two horſes, or at rate 8 per acre, 18 days, at 6 *d.* per diem, | 3 | 12 | 0 |
| 3d crop of hay, 24 cwt. at 2/6 . . . | 3 | 0 | 0 |
| 4th do. excluſive of feed, . . . . | 3 | 0 | 0 |
| | | 22 | 0 0 |
| Deduct and expence, . . . . . | | 6 | 5 0 |
| 2 years—Clear profit per acre, . . . | *L.* | 15 | 17 0 |

Encouraged by this ſucceſs, I went this year, 1793, largely into the culture of lucerne; as land marks to others, my errors and loſſes are now to be recorded.

*20th March*, 1793.

EXPERIMENT, NO. 2.

LAND a light loam, indifferently prepared for wheat by two ploughings only, being an old paſture in little heart, ploughed every fifth year for fifty years paſt, and never manured; ſown laſt autumn with wheat; ſowed over eight acres of the wheat, lucerne and clover, in various proportions, to the amount of forty pounds of clover, and ſeventy-ſix of lucerne ſeed; manured at the ſame time with fifty-ſeven buſhels of gypſum in various proportions, from five to ten buſhels per acre. The largeſt quantity produced the beſt wheat, and the whole being better than could have been expected from the ſoil; the farmers who inſpected the crop were of opinion, that the gypſum had been of uſe to the wheat. The graſs ſeeds vegetated very well, and came up thickly, but not vigorouſly. A drought, very unuſual at that ſeaſon, came on as early as the laſt of April, and continued till the middle of June: the clover and lucerne promiſed ſo little when the wheat came off, that I fed the ſtubble (this experiment-ground being part of a large field); I ſhall order it to be encloſed, to ſee whether the next year will repay a part of my expences, which ſtand as follows:

| | | | |
|---|---|---|---|
| 116 lb. lucerne and clover ſeed, . | 6 | 9 | 4 |
| Sowing, . . . . . | | 3 | 0 |
| 57 buſhels of gypſum, at 4*s*. . . | 11 | 0 | 0 |
| Carting and ſowing do. . . . | 0 | 10 | 0 |
| | *L.* 18 | 2 | 4 |

EXPERIMENT, NO. 3, 1793.

LAND, a light ſandy loam, three years under clover, and twice in that time manured with gypſum, ſeven buſhels to the acre; broke up 20th April, ſowed with oats on one ploughing, ſod hurrowed fine; over three acres of this ſowed on the 1ſt of May, eight pounds of clover, and eight pounds of lucerne ſeed to the acre mixed, at the rate of 16 lb. ſeed. The oats came forward with ſuch luxuriance (yielding ſixty-four buſhels on the average to the acre), and ſuch abundance of ſtraw, that the greater part was lodged, and the graſs ſeeds ſo effectually deſtroyed, that I have ſince ploughed up the ſtubble; this was alſo dreſſed with gypſum, five buſhels to the acre.

EXPENCE.

| | | | |
|---|---|---|---|
| 48 lb. clover and lucerne ſeed, . | *L.* 2 | 16 | 0 |
| Sowing, . . . . . | 0 | 2 | 0 |
| 15 buſhels of gypſum, at 4*s.* . . | 2 | 16 | 0 |
| Sowing do. and harrowing, . . . | 0 | 6 | 0 |
| Entire loſs, except the gypſum may be of uſe in the next crop, | *L.* 6 | 0 | 0 |

EXPERIMENT, NO. 4, 1793.

SOIL and management as above; being part of the ſame field. Ploughed twice for barley; once laſt autumn; once early in April; ſown with barley about 20th. Sowed the next day two acres of this ground with clover and lucerne, mixed eight pounds of each to the acre, except about half

an acre with lucerne alone, 16 lb. to the acre, harrowed with a light harrow. The lucerne and clover came up very well, and would have produced about half a ton of hay to the acre, had it been mown this autumn; it has been fed down, though not ſo cloſely as to injure it. Put in at the ſame time, and in the ſame manner, one acre upon a ſtrong loam, laying flat, and ſomewhat wet, the ground having yielded potatoes for the two laſt years. The lucerne after the barley on this ground, is very promiſing, and has not been fed—Expences the ſame as above, *L.* 6 o o on the three acres: however I am well ſatisfied that the enſuing crop will amply repay the expence.

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EXPERIMENT, NO. 5, 1793.

LAND, a hill ſide; ſoil, ſlaty gravel, on a clay bottom, had been two years under white clover, brought in by gypſum, without being ploughed or feeded. Ploughed twice this ſpring and ſummer; one acre ſown with one peck of buck-wheat 1ſt July, after which ſeeded with 18 lb. of lucerne, and manured with 7 buſhels of gypſum, a ſhower fell juſt after it was ſown. The lucerne came up ſtrong and healthy, and for ſome days ſeemed to keep pace with the buck wheat; but this in a ſhort time, owing to the gypſum (as appeared by a ſmall ſpot that I had not given any,) ſhot far a-head, roſe to near five feet in height, and ſo effectually overſhadowed the lucerne, that I had

no hopes of ſaving it, but by cutting down its too powerful rival; I moved a ſmall part, but ſo much againſt the inclination of my overſeer, who wiſhed to ſee whether it would be as productive in grain as in haulm; in which I own alſo my own curioſity was very much intereſted; I accordingly let four-fifths of the piece take its chance, and the lucerne continued as well as it was able with its umbrageous inmate. Where the buck wheat had been cut, the lucerne at firſt languiſhed, from being ſo ſuddenly expoſed to a hot ſun; but, as the buck-wheat roſe again, the lucerne ſprung with it, and neither much out-topping the other, the firſt recovered its looks, and promiſes very well. Where the buck-wheat was left to ripen, as the whole lodged, the lucerne, if not abſolutely dead, is at leaſt ſo very ſickly, that I dare not promiſe myſelf much return from this experiment.

EXPENCE OF EXPERIMENT, NO. 5.

| | | | |
|---|---|---|---|
| 18 lb. ſeed, at 14*d.* . . . . . | 1 | 1 | 0 |
| Sowing and harrowing, . . . . | 0 | 2 | 6 |
| 6 buſhels gypſum, and ſpreading, . | 1 | 7 | 0 |
| | *L.* 2 | 10 | 6 |

EXPERIMENT, NO. 6.

PLOUGHED one-third of an acre of oats-ſtubble, mentioned in Experiment No. 4; ſowed 1ſt Auguſt with turnip-ſeed and 5 lbs. of lucerne, being all I had left; the turnips too ſmall to gather, the lucerne came up well, conſidering the

quantity of ſeed, which was much too ſmall, the only object of this experiment was to ſee whether ſowing upon ſtubble would forward the plant more than a ſpring ſeeding. Next year will anſwer this enquiry.

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EXPERIMENT, NO. 7, 1793.

BROKE up the middle of May a ſmall ſtrip of ground next to the lucerne of Experiment No. 1. Raked fine and put in 1 lb. lucerne-ſeed alone. This came forward ſo faſt as to flower, and many plants, had they not have been cut, would have probably perfected their ſeed.

The general reſult of theſe experiments, in which I have employed 230 lb. of ſeed, and expended *L.* 34 6 10, cannot be abſolutely pronounced upon till the next year. No. 1 will doubtleſs pay me the enſuing ſeaſon, what it has done this, as it contains no marks of deterioration, to wit: *L.* 3, after deducting all expences for one quarter of an acre, or *L.* 12 per acre clear profit.—No. 2 may poſſibly pay its expences in good paſture next year, as the lucerne and clover are ſtill alive, though not promiſing.—No. 3 is totally loſt.—No. 4 looks ſo well, that I can hardly doubt that it will yield as much as my firſt experiment did, that is about three tons of hay an acre the firſt year, and proportionably afterwards; nor am I quite out of hopes of No. 5.—It might perhaps have

been thought better to have deferred this communication till another year had afforded me the means of ſtating theſe reſults; but as I was led into this courſe of experiments with a view to acquire ſuch a knowledge of this plant, and the mode of cultivating it, as would enable others to avail themſelves of my errors and my experience, without incurring expences that would diſcourage them in the outſet, I have thought it prudent thus early, to ſtate them, ſince even now, important deductions may be drawn from them.

From the firſt experiment it appears, that it may be eaſily ſown on a dry ſoil with oats and clover, and that its annual clear profits, after deducting every expence, will exceed, on the two firſt years, *L.* 7 per acre. The failure therefore of that ſown this year with oats, muſt be aſcribed to the following cauſes: 1ſt, A luxuriance in the oats, which was by no means to be expected from the ſoil, and is wholly to be attributed to the improvement it had received from clover and gypſum, and is ſo far a ſtriking leſſon to farmers, as well as a confirmation of the conjectures I had the honour to ſubmit to the Society on the effect of gypſum as a permanent improver of the ſoil. 2d, The oats having been ſown on one ploughing, ſo that the ground was leſs mellow than it ſhould be for the reception of lucerne.—3d, To the extreme drought of the ſpring; clover having not ſucceeded better than lucerne, when ſown together. The ſecond experiment proves that ground which has not been

ploughed in the ſpring, or pulverized fully, is improper. The failure, however, of this experiment, may in ſome ſort, be charged to the early ſowing, ſince the rapid growth, of that ſown with the buck-wheat, during the hotteſt ſeaſon of the year, would intimate, that the ground ſhould be warm and mellow, to ſuit the conſtitution of this plant while in its infant ſtate. The ſucceſs that attended the ſowing with barley proves, that notwithſtanding the unfavourable ſeaſon, if the earth is properly pulverized, a good product may be expected.

An important queſtion ſtill remains to be decided, relative to the propriety of ſowing lucerne alone or mixed with red clover ſeed. I was prejudiced in favor of the latter mode from the following conſiderations:

1ſt. I wiſhed to know whether it was equally hardy with clover? Whether under ſimilar circumſtances it was able to contend with it in our climate? Experience has convinced me that it will, and that in dry ſeaſons it will flouriſh—while clover is too faint and languid to raiſe its drooping head; and what is more extraordinary, that this child of the ſummer, better braves the biting froſts of the ſpring and the keen autumnal blaſts, than clover, or any cultivated graſs of this climate.—Theſe are important circumſtances, when I am labouring to introduce it into common huſbandry, in the face of prejudices ariſing from the Engliſh experiments, which are far from encouraging to farmers of moderate capitals; I hope, however, to ſhew,

that it is infinitely better adapted to our climate than to that of Great-Britain.

2dly. It having been conſtantly aſſerted that it takes three years to come to perfection, and that the proſpects are very trifling the year ſucceeding that in which it was ſown, by mixing the ſeeds with thoſe of clover, I expected, and indeed found, that an immediate profit might be obtained; for the clover came forward as early, as if it had been ſown alone, was ſupported by the lucerne, which added ſomething to the crop, and both together yielded at the rate of more than three and a half tons an acre, the very firſt year; the merit of the laſt cutting being wholly due to the lucerne, ſince the drought prevented the clover from riſing a ſecond time to the ſcythe; ſo that, had this field been ſown with clover alone, it would have yielded twenty-four hundred weight per acre, and leſs than it did by the addition of the lucerne ſeed the *very firſt* year.—The ſecond year's product is ſtill more concluſive in favor of the lucerne.

3dly. As clover is a beneficial plant, I expected that as the lucerne advanced, the clover would die out and leave the ground free from weeds that might have robbed the heritage during the minority of the lucerne. Tho' this reaſoning was plauſible and influenced my conduct in my experiments this year, yet I am not ſatisfied that it is juſt. I argued from Engliſh books of huſbandry, which are not however, calculated *in this particular*

for our climate. The principles they maintain are—1ſt. That lucerne does not attain any conſiderable degree of ſtrength till the third year; hence the neceſſity with them of drilling and hoeing to keep down the weeds. Some that I ſowed this year with my barley, as well as a crop which my neighbour Mr. De La Bigarré ſowed with his, yielded, on being cut this very autumn after his barley, almoſt eleven hundred weight per acre, convinces me that its growth is more rapid here than in England—(In this however it is not peculiar, as I ſhall on ſome other occaſion ſhew that plants grow more rapidly by two-fifths here than in Britain) I am therefore very doubtful whether it will not pay as much and as early, provided from 16 to 24 lb. of ſeed are ſown to the acre, as the mixed crop would do. This I ſhall next year aſcertain with accuracy.—Should it be eſtabliſhed on experiment, the clover-ſeed ſhould be omitted, as it tends to check the lucerne, and to render the crop thin when it dies out; beſides, that neither ſpringing ſo early, nor bearing drought ſo well, it muſt be conſidered as inferior, in every reſpect, to the lucerne. There is one conſideration however in its favour, that is, that in warm ſituations, the lucerne will be fit to cut before the clover riſes to the ſcythe. The ſecond crop in this caſe, will be earlier, on account of the clover, which will conſiſt almoſt wholly of it, becauſe having eſcaped the wounds which the lucerne received, it will be ready to take the field before the lucerne has recovered from its amputation.

There are two conſiderations which render weeds here leſs troubleſome than in Britain; the *ſeverity of our winter*, and the *heat of our ſummer*. Many, from the firſt of theſe cauſes, are annual here, which are perennial there, by being able to live thro' their mild winter. The ſlighteſt fallowing in the heat of ſummer, kills moſt weeds here, while in England their moiſt climate enables the greateſt part of them, like Anteus, to bid defiance to wounds and bruiſes, if they are permitted but to touch their parent earth. We may add to this that the indigenous weeds of this country are few, becauſe the children of the foreſt, as well of vegetable as of animal tribes, fly the haunts of men; the only troubleſome weeds we have are convicts, that have been tranſported from our mother-country —They muſt therefore, neceſſarily, be much fewer than thoſe that remain behind, not only becauſe the habits of many of them are too delicate to aſſimilate themſelves to our unpoliſhed climate, but becauſe their number, in both countries, muſt be proportioned to the time from which they began to be cultivated, and to the extent of their commerce—for *weeds* and *vices* are the children of *cultivation* and *commerce*. Nor will they ever be eradicated in an improved country till ſome agricultural millenium ſhall advance cultivation to the higheſt poſſible point of perfection: All theſe conſiderations form decided arguments in favor of the cultivation of lucerne (whoſe greateſt enemy is ſaid to be weeds) in this country, rather than

in England. Upon the whole then I would recommend, as the reſult of my experiments, as far as they have yet gone :

1ſt. Never to ſow on ground that is not perfectly pulverized.

2d. Not to ſow till the earth has acquired a degree of warmth friendly to rapid vegetation, that is, not earlier than the month of May.

3d. To ſow with no crop that will probably lodge.

4th. If ſown with buckwheat, to apply no gypſum or other manure, till the buck-wheat is off.

5th. Where the quantity to be ſown is ſmall and the farmer can afford to loſe a crop, to give the ground one turn in the autumn, another in April, harrowing it fine, and a third the beginning of May, and then if the weather is mild and warm, ſow, if the ground is in perfect tilth, otherwiſe give it another ploughing : 18 or 20 lb. of ſeed are not too much ; were it not for the expence, I ſhould prefer 25lb. if an early profit is the object.

I fear that I have, in the opinion of many, dwelt too long on this ſubject ; if I have, my apology will be found in my anxiety to impreſs upon my countrymen, the importance of cultivating this plant, which I am ſatisfied, is better adapted to our climate, than clover ; which exacts no more labour ; which leaves (I ſpeak upon the authority of Young's travels) the ſoil much

better than it found it; which will even bear paſturing; having myſelf remarked two plants in a common paſture which had defied the bite of cattle for upwards of twenty years, one of which is ſtill alive.

Theſe conſiderations have induced a conviction in my mind, that the man who introduces a plant which promiſes to be ſo important to agriculture, will have a better claim to the gratitude of his country than any other, that one only excepted, whoſe military and civil virtues have afforded us the means of purſuing in peace, our ruſtic labours. I confeſs that I am not unambitious of that honor—to the rich I have facilitated the means of procuring the feed, which has hitherto been very rare here; ſmall parcels I have diſtributed to common farmers whoſe exertions I have ſtimulated, by ſhewing the flouriſhing ſtate of my little field; nor can I conclude without addreſſing myſelf (in the words of the goſpel) to every member of the corporation who is bleſt with equal or greater means "*go thou and do likewiſe.*"

# EXPERIMENTS
## ON LUCERNE.

*By the Hon. ROBERT R. LIVINGSTON,*

*(Continued—from laſt year.)*

THE delay which has attended the printing of our memoirs, enables me to lay before the Society, a continuation of the experiments upon lucerne, which I had laſt year the honor to ſubmit to their conſideration.

### No. 1.—CONTINUED.

1ſt April—Manured with ten loads of black earth from a ſwamp—or at rate of forty loads to the acre.

It was very luxuriant and cut twice before the twentieth of June for plough-horſes kept in the ſtable—being when they began to cut each time, about ſixteen inches high, the average heighth, taking the firſt and laſt cutting, each time about 20 inches. On the 24th July, cut and made into hay, produced 1000 wt. or two tons to the acre. On the laſt of Auguſt, cut a fourth time—produce 600 wt. or 1 ton 400 wt. to the acre. The fifth crop is not cut, but is now the 1ſt October, 20 inches high, and very promiſing in its appearance; if we have no ſevere froſt before the middle of this month, it will produce about 600 wt. of hay.

Produce and expence per acre of No. 1.

EXPENCE.

| | | | |
|---|---|---|---|
| 40 loads of black earth from an adjoining ſwamp—at 1ſ per load | *L.* | 2 | 0 0 |
| Cutting 5 crops and making three into hay—at 8ſ | | 2 | 0 0 |
| | *L.* | 4 | 0 0 |

Two firſt crops valued at 500 wt. hay each, or

| | *Tons.* | *C.* | | | | |
|---|---|---|---|---|---|---|
| | 2 | 0 | 0 | | | |
| 3 crops in hay | 2 | 0 | 0 | | | |
| 4th crop in do. | 1 | 4 | 0 | | | |
| 5th eſtimated at | 1 | 0 | 0 | | | |
| | 6 | 4 | 0 | | | |
| 6 tons 4 cwt. at 2ſ6 | | | | *L.* | 15 | 10 0 |
| Expences above | | | | | 4 | 0 0 |
| Profit | | | | *L.* | 10 | 10 0 |

There are ſo many vacant ſpots in this piece, owing to its being too thinly ſeeded, that I am ſatisfied that had I ſown the lucerne alone, at the rate of 20lb. inſtead of 8lb. to the acre, that produce would have been at leaſt one third more, tho' I believe *L.* 10 10 per acre, after paying for manuring and all expences, will be deemed ſufficient profit to juſtify the culture of this in preference to any other graſs.

No. 2—CONTINUED.

The lucerne ſown over the wheat in the ſpring of 1793, yielded nothing, ſo that the whole of this muſt be ſtated as

loſs, except that the expence of gypſum ſhould be deducted from the account, as it produced a very noble crop of white clover, on ground on which I ſhould otherwiſe have had little paſture.

It is however to be remarked, that the red clover ſeed ſown over the wheat at the ſame time, in the manner mentioned in the experiment, ſucceeded no better than the lucerne; this muſt be attributed in part to the ſeaſon—and the experiment of lucerne upon wheat ſhould again be tried, but only on a ſmall ſcale, as I am inclined upon the whole to think it will ſeldom ſucceed.

The lucerne ſown with the oats, as I mentioned, was ſo choaked by it as to promiſe nothing; that ſown with buck-wheat very little for the ſame reaſon, and both were ploughed up. The remaining experiments are thoſe in which the lucerne was put in with barley and with turnips. The firſt of theſe I muſt divide into two claſſes—1ſt. That ſown on light-loam—2d. That ſown on clay.

*Product and expence, per acre, of two acres of lucerne, ſown with barley and clover, April, 1793.*

| | T. | C. | Q. |
|---|---|---|---|
| 26th June, cut and made into hay | 1 | 2 | 0 |
| 26th July | 1 | 5 | 0 |
| 20th September | 1 | 4 | 0 |
| | 3 | 11 | 0 |

| | | | |
|---|---|---|---|
| Expence per acre cutting and making hay 8*ſ* per acre . | *L.* 1 | 4 | 0 |
| 3 tons 11 cwt. of hay, at 2*ſ*6 . . . . | *L.* 8 | 17 | 6 |
| Deduct expences . . . . . | 1 | 4 | 0 |
| Clear profit . | *L.* 7. | 13 | 6 |

Part of this was injured by the poultry and pigs which were conſtantly upon it—thoſe parts on which clover was mixed with the lucerne, very much inferior to that on which the lucerne grew alone.

### Lucerne *and* Clover *on* Clay.

This cut only twice—the ſecond time the 20th of Auguſt: The product at both cuttings three tons to the acre—the firſt crop was much injured by the cattle breaking in, and by its being lodged. The lucerne among the clover is now fit to cut a third time, but having been ſown thin, it will not make a crop alone, and the clover is too ſhort to be worth cutting; but the after graſs is ſo fine, as to be adequate to all the expences attending the two firſt crops, ſo that the three tons of hay or *L.* 7 10 may be conſidered as the neat profit upon this acre.

### Lucerne *ſown with* Turnips, *Aug.* 1793.

I expreſſed my fears that this lucerne would hardly live thro' this winter—however I was agreeably diſappointed; early in the ſpring, tho' the plants were ſmall, and as I thought much

too far apart, yet as the ſeaſon advanced, they ſhot forward very luxuriantly, and this piece has been cut three times with that ſown with barley. Altho' ſown near four months later, the firſt crop was nearly equal to the barley ſown, the ſecond and third much ſuperior to it, ſo that its acreable produce may be ſtated at four tons; and its future product will be greater than any I have, as it is perfectly even, without any vacant ſpots, and uninjured by the clover which I ſowed with my other crops.

The introduction of a new plant is liable to ſo many difficulties from ill management and prejudice, that I think it important ſtill to continue the regiſter of my experiments at the riſk even of tiring the patience of the Society.

I remember the avidity with which I read every thing that I could find on this ſubject before I began my own experiments, and I remember too how much all I read fell ſhort of my wiſhes in many particulars, which I am now able to elucidate for the benefit of others.

EXPERIMENT—NO. I.

*Sept.* 1793. Ploughed up four acres oats-ſtubble, ſoil, a light loam—1791-1792 in clover, manured with gypſum; 1793, in oats, yield very great—about 64 buſhels to the acre.

*April,* 1794. Ploughed twice—1ſt May ſowed two acres with barley and 36lb. of lucerne ſeed, which covered by the roller.

This barley was but tolerable, yielding about 20 buſhels to the acre. The lucerne is far from anſwering my expectation; it is thin and in patches; the rains which prevail this ſummer have filled the ground with clover, ſo that I expect next year to cut more clover than lucerne from this ground.

EXPEIMENT, NO. 2.

The adjoining acre was ſown with lucerne alone without barley. It looks at preſent exactly as that ſown with the barley, neither promiſing much as *a lucerne crop.* I ſhould obſerve that theſe plants came up very thick and well, but ſoon changed their colour in ſpots to yellow, and died away, except where the ground was rich.

EXPERIMENT.—NO. 3.

Ploughed up $\frac{3}{4}$ of an acre that had been in potatoes laſt year, ſoil as above: dung was put in the rows when the potatoes were planted at the rate of 40 loads to an acre.

1ſt May, ſowed with barley and 12 lb. of lucerne-ſeed; the barley good, but much injured by the poultry, being near my houſe. The lucerne a very fine and promiſing crop, cut the laſt of September, about half a ton to the acre. This experiment is important, ſince it proves that if lucerne is ſown in the ſpring, it ſhould be on ground in good health, and warmed with dung. I have no doubt of cutting 4 or 5 tons of hay next year from this ſpot.

EXPERIMENT—NO. 4—one acre, 1794.

Soil as above, but poorer—ſown this ſpring with vetches, they were cut 20th July, for hay—ploughed immediately after, and put in 18lb. lucerne ſeed; it came up very thick, and maintains a healthy colour, though the ground is very full of weeds; this gives me no uneaſineſs as they are annuals, and the ſeaſon too far advanced to permit them to ripen their ſeeds; they will only ſerve to protect the lucerne againſt the cold of the enſuing winter.

EXPERIMENT—NO. 5.

Half an acre of my laſt year lucerne ſtanding very thin, I ploughed it up this year, and firſt July, ſowed it with 8lb. of lucerne ſeed and a ſmall quantity of turnip ſeed, having previouſly manured the ground with ſtable-dung—this, with a very wet ſeaſon, has brought up ſo many weeds as to injure the lucerne by overſhadowing it, tho' it came up very vigorouſly —on the 20th Aug. mowed the weeds and turnip tops, which were very large, not however mowing very cloſe. The lucerne at this time, 1ſt Oct. tho' very full of weeds, has a fine healthy appearance, and I have no doubt of its doing very well; the turnips do not appear to have been injured by the mowing.

EXPERIMENT—NO. 6.

Soil as above—1ſt May, planted three-fourths of an acre, with early potatoes, the beginning of the 1ſt Aug. took them

up and put in upon one ploughing 12lb. of lucerne ſeed—this has come up even and thick, and is very free from weeds; if it ſtands the winter, which I hardly doubt, it will make a very fine crop the next year.

EXPERIMENT—NO. 7.

One acre of gravelly clay ſown this ſpring with vetches left for ſeed, cut about the laſt of Auguſt and the beginning of September, ſowed with 16 lb. lucerne: It is now (1ſt Oct.) but juſt beginning to ſhew itſelf, owing to there having ſcarce any rain fallen ſince; and the reſult of this experiment will determine whether it may ſafely be ſown with wheat in good ſoils, and how far it is capable bearing cold when very young.

Having with a view to introduce this very uſeful plant, made (as I believe) more experiments, and upon a larger ſcale than any other farmer in America, I ſhall ſtate the concluſions which I have drawn from them, as inſtructions to others that may chuſe to cultivate it.

1ſt. It appears to me to be full as hardy as clover; but like it, to delight in a warm dry ſoil, tho' it will flouriſh in a moiſt clay—ſubject, however, to the ſame caſualties in open winters, when both will be thrown out by the froſt.

2nd. When very young it requires a natural or artificial warmth in the ſoil, otherwiſe it languiſhes, and when the weeds and natural graſſes come up, it is unable to contend with them.

Theſe two obſervations point, firſt to the ſoil in which it ſhould be ſown; to wit, a warm dry ſoil in tolerable heart; and ſecond, to the means of procuring the warmth which I ſpeak of as neceſſary to the plant; this may be obtained in two ways: 1ſt, by dung; and, 2d, by ſowing when the ſun has given the earth an additional heat. If ſpring ſowing is intended, I ſhould prefer ground that had been manured and bore a potatoe crop the year preceding, becauſe by that means the weeds which the dung produces will have been deſtroyed by the hoeing of the potatoes. If no ſuch ground is ready, and a ſpring ſowing is intended, the dung ſhould be ploughed in July or Auguſt, and the ground harrowed fine; this will bring the weeds forward, when a ſecond ploughing, and the winter will deſtroy them before they have perfected their ſeeds; the lucerne may be ſown early in May (20lb. to the acre) after the ground has had three or four ſpring ploughings with barley, which will pay the expence of the manure and ploughings.

Second mode by which the ſeeds will come up quicker, and with more regularity, is to manure early in the ſpring, and to plough and harrow the ground fine when the weeds have ſprung and got ſome head; and when the earlieſt kinds begin to bloſſom, plough again and harrow fine; repeat this four times by the 1ſt of July, when the lucerne ſeed ſhould be ſown (16lb. to the acre) every ſeed of which will then vegetate: The ſeed ſhould always be ſown when the ground is dry, and rolled in,

if committed to the earth while it is very moiſt, the ſeeds will ſwell, and if a dry ſeaſon ſucceeds before they have ſtuck root, they will wither away.

3d—Lucerne is frequently liable to turn yellow, and look ſickly. I have not been able to diſcover the cauſe of this evil, tho' I have carefully examined the roots with a microſcope—The remedy is to mow the plant; it will come up free from the diſorder.

4th—The time for cutting this for cattle is when ever it will fill the ſcythe; for hay when it begins to bloſſom, if left till the bloſſom turns, it becomes too hard: I would prefer cutting for cattle the firſt year, as this effectually deſtroys all weeds.

5th—It may be fed down by any kind of cattle with as much ſafety as clover.

6th—I would recommend it to the young farmer not to be diſcouraged from purſuing the culture of this plant by the obſervations of ſome of the older ones, who will tell him that Mr. A and Mr. B tryed it, *but it would not do.* Experiments careleſsly made, or not regularly purſued, the accidental circumſtances of ſoils, or ſeaſons, afford no concluſive arguments, as may be inferred from the regiſter which I have exhibited. Out of about fifteen acres which I ſowed laſt year, but four ſucceeded; had I not tried the plant in various ways, I ſhould probably have determined that it was

not worth attention. My errors and inſtructions will render the taſk eaſier for thoſe that chuſe to attempt future experiments. And whether they ſucceed or not, they will render agriculture ſome benefit by communicating to this Society the reſult of their experiments.

R. R. LIVINGSTON.

*Clermont, 4th Oct. 1794.*

*Extract of a Letter from* ROBERT R. LIVINGSTON, *Esq; to the late* WM. LIVINGSTON, *Esq; Governor of* New-Jersey, 1785, *on the Subject of* GREEN-GAGE PLUMBS.

MRS. LIVINGSTON informed me when I was last at Elizabethtown, that you had not been successful in raising the green-gage plumb. I send you two of a very fine kind; I have now above twenty bearing trees, none of which have been grafted, but were all the offspring of one that was raised from the stone of a grafted tree, which has produced some hundred trees, as those I send you will do, if planted in a loose soil. The general complaint is, that this fruit drops before it ripens: I do not find that this is the case with mine, except so far as is necessary to keep the tree from being over-loaded.—I cannot help thinking, therefore, that these trees have in many places suffered (in common with an higher order of beings) from the ignorance of their physicians, who insist that this evil arises from too great a quantity of sap, or, in other words, from too much health, and accordingly direct a spare regimen, and plant them in stiff soils, where they cannot feed without difficulty; and lest they should not suffer enough from this treatment, they cut their roots, put stones in their mouths, bind their bodies with bandages, and even go so far as to pierce and beat them, as if the fruit of this tree, like that of religion, was the offspring of mortification.

I have never yet heard, that theſe preſcriptions have been attended with much ſucceſs; nor do I think they ever will.—Except man, I know no animal that ſuffers from a plethora, nor would he, if luxury had not provoked his appetite to exceed its natural bounds; all others acquire ſtrength from plenty of food; the ſame reaſoning applies to vegetables, whoſe ſeeds and fruits are always moſt perfect, when a ſufficiency of food is furniſhed them. The plumb is in no ſoil a very vigorous tree; its growth is ſlow; and when it begins to bear, it is generally very heavily laden; as the fruit increaſes in ſize, it makes a demand upon the roots for more ſap than they can readily furniſh, particularly as the droughts often come on juſt as this demand is made. The circulation in the tree becomes more languid, and the fruit alters, withers and drops for want of nouriſhment, or is deſtroyed by worms, which are produced in it, as in the ſtomachs of feeble children, from unwholſome food.

If this reaſoning is juſt, the remedy muſt be the reverſe of that, which is uſually preſcribed. I have therefore always planted my plumbs in the richeſt ſpots of my garden (the ſoil of which is a loam upon a light ſand, dug up and mixed, and very highly manured every year), and my trees have ſcarcely ever failed to ripen as much fruit as the branches could carry without danger of breaking. I have alſo had ſome plumbs upon a ſtiff clay, none of which have borne any fruit worth ſpeaking of; one, a Drap D'or, had ſtood fifteen

years, and was not nine feet high when I removed it into my garden laſt ſpring a year; it has grown more ſince, than in the fifteen years preceding. Theſe circumſtances convince me that my theory is right, and has induced me to enlarge upon it, in hopes that it may be uſeful to you, and that when confirmed by your experiments, it may be adopted by others.

THE

# MANNER OF TAKING PORPOISES,

AT THE

# EAST END OF LONG-ISLAND.

*By* EZRA L'HOMMEDIEU, *ESQUIRE*,

VICE-PRESIDENT OF THE CORPORATION.

A SEINE is made eighty rods long, with lines about the bigneſs of ratline ſtuff, ſuitable for a veſſel of ſixty tons; the meſhes are nine inches ſquare, and the ſeine, in depth, is between twenty and thirty feet, or according to the depth of water where it is propoſed to take the fiſh: the buoys, are made of tight caſks of the bigneſs of ten gallon kegs.—The ſeine is ſet parallel with the ſhore and kept ſtraight, by an anchor at each end, with a buoy, at the diſtance from the ſhore, of about eighty rods. Two other ſienes are made with meſhes of ſix inches ſquare, with cordage of the bigneſs of a large codline. The two ſeines are put in ſeparate boats which lie at the ſhore, oppoſite the ends of the great ſeine. The porpoiſes go in ſhoals, and in following the ſmall fiſh, come between the ſhore and the great ſeine; when the porpoiſes are got about the middle of the ſeine, one boat ſets off a-head of them, and goes directly to the end of the great ſeine, throwing out the light ſeine from the ſhore to the end of the great ſeine, when they are both faſtened together, and diſcharged

from the anchor: The other boat goes off ſoon after the firſt, and in like manner puts out the ſmall ſeine, till it is faſtened to the other end of the great one. The fiſh are then entirely incloſed. A number of ſtakes are put down in the beach, oppoſite the great ſeine about three rods aſunder; a capſtan, which two men can carry, is faſtened with a rope at the outermoſt ſtake at each end. A large rope from the capſtan is faſtened to the lead-rope of the ſeine, and each end is hove up by two men with this capſtan; and after the ſeine is hove up to the capſtan by the rope, the rope is then fleeted and faſtened again to the ſame lead-rope, at the edge of the water; and, as often as is neceſſary the capſtans at each end are brought nearer together and faſtened to the next ſtakes. As ſoon as the ſmall ſeines are aſhore, and you begin to draw on the great ſeine, three or four boats are ſent behind the ſeine, and the top line of the ſeine is lifted on the gunnels of the boats, leſt the porpoiſes ſhould make an attempt to jump over; hitherto, they have been very eaſy and quiet, but as they find they are circumſcribed within a ſmall compaſs, and the water begins to grow ſhoal they grow uneaſy, and collect together in a body, and as if by mutual conſent or agreement, they all go as one with their utmoſt force againſt the bag of the ſeine: Their force is ſo great when there are many together that it is neceſſary to let the capſtans run, leſt ſomething might give way; after this attempt to eſcape is over, they do not make the ſecond exertion, but become very gentle, ſo that

you may wade among them and put the ſlip-nooſe over their tails, or ſecure them with an iron, and hawl them up on the beach, where they are ſtuck in the jugular veins with a knife, and ſoon die by bleeding.

The blubber or fat on theſe fiſh is from one to two inches thick, and they make on an average ſix gallons of oil. After they are dead the blubber is cut through on the belly and on the back from the head to the tail, and is pealed off from the fleſh or lean part in halves. The ſkin of thoſe fiſh is ſo cloſe to the blubber, that there appears to be no ſeparation, and it cannot be ſeparated in the uſual way with a knife. Theſe half ſides when taken from the Porpoiſe are laid on a beam ſimilar to the one a currier or tanner uſes in taking the fleſh or hair from hides, with the ſkin downwards, and with a knife not unlike a currier's fleſhing knife, the blubber is pared down till you get to the ſkin; they are then ſent to the tanner, when they are made into leather, which is the ſtrongeſt of any hitherto known, and is excellent for the upper leather of boots and ſhoes.

# EXPERIMENTS MADE BY MANURING LAND WITH SEA-WEED,

TAKEN DIRECTLY FROM CREEKS,

AND WITH

# SHELLS:

*BY EZRA L'HOMMEDIEU, ESQ.*

THE year before laſt I fenced about ten acres of poor land of a light dry ſoil, and which produced little except *five-fingers and ground pine;* it was ploughed up and planted with corn, which was dunged in the holes, but the land was ſo poor that the crop did not pay the expence of culture. Laſt year I contracted for one hundred tons of ſea-weed, at fourteen pence per ton, and let out five acres of this piece of ground for raiſing wheat. I was to find the manure, twenty ox-cart loads to the acre, which was to be carted and all other expences borne in raiſing the crop, and I was to have the one half of the wheat delivered in the ſheaf in the field: Early in March the five acres was ſowed with clover ſeed; at harveſt the wheat much exceeded my expectation; that which was beſt put in, by computing the ſhocks, would yield ſixteen buſhels per acre—the clover came up very well and after harveſt headed, and the heads being collected by women and children among the ſtubble,

the beſt of it yielded a buſhel per acre, on an average ſay forty pounds (the one half of which I gave for gathering); there would have been much more had it not been for the difficulty of collecting among ſtubble which muſt principally be done by hand; there is no doubt but this five acres will yield at leaſt one ton of hay to the acre the next ſeaſon. The computation of profits on this five acres is as follows:

| | | | |
|---|---|---|---|
| The one half of the crop, on an average, ſay | | | |
| 7 buſhels wheat per acre at 8s. - - | £ | 2 | 16 0 |
| 20 lb. Clover-ſeed - - - - - | | 1 | 0 0 |
| | £ | 3 | 16 0 |
| Deduct 20 tons of manure, at 1s. 2d. - - - | | 1 | 3 4 |
| The neat profit per acre is - | £ | 2 | 12 8 |

The land was not worth more than forty ſhillings per acre; but by this tillage, the land, by the loweſt computation, muſt now be worth five pounds per acre, which makes the difference of three pounds, which being added to the neat-profit, makes five pounds twelve ſhillings and eight pence clear gain per acre. Three acres of this piece of land, directly after the wheat was ſown, was covered with drift ſea-weed, which coſt nothing but the carting: Early in the ſpring it was ſowed with clover ſeed, the ſea-weed prevented any injury to the wheat from the winter, the kernel was good, and yielded eight buſhels to the acre: the clover came up well, but did not produce more

than half the quantity of feed which the land adjoining did, which was manured with ſea-weed from the creek. Perhaps theſe three acres may yield half a ton of hay by the acre the next ſeaſon. The remaining two acres I manured with ſhells called Indian ſhells; that is, the ſhells of clams, oyſters, wilks, and ſcollops, collected by Indians, and by length of time ſettled under the ſurface of the ground, and ſo diſſolved as to be broken in pieces and mixed with the earth; twenty loads to the acre were carted on the two remaining acres of the ten; on one acre twenty tons were carted and laid in heaps ſix weeks before ſowing: on the other acre the twenty loads was carted and directly ſpread, and harrowed in with the wheat: theſe two acres were ſowed early in the ſpring with daiſy-ſeed at harveſt; the laſt-mentioned acre did not produce a ſufficient quantity of wheat (although the kernel was good) to pay the expence of tillage ſeparate from carting the ſhells. The other acre where the ſhells lay in heaps only ſix weeks, was equal to that covered with drifted ſea-weed. The daiſy-ſeed came up well on both acres, but grew much better on the acre where the ſhells lay in heaps, than on the one where the ſhells were immediately ſpread, and by appearance will produce a good crop of that hay the next ſeaſon: in many parts of the country, eſpecially on the ſea-coaſt, there are vaſt quantities of thoſe Indian ſhells, and by the above experiment, it is neceſſary for a crop of grain, that the ſhells be expoſed to the air ſome time before they are put in the ground: if they are

carted in the ſpring, and lay in heaps till ſowing, it may well anſwer the purpoſe, though the longer they lay in heaps perhaps the better for the crop; a few experiments which may be made without any expence, will determine the time neceſſary for their expoſure. By a number of experiments made in Suffolk County, thoſe ſhells are found to be a durable manure, and very favourable to the production of graſs, and the land for a number of years is growing better both for graſs and grain.

ON

# DITCHES AND HEDGES:

*By EZRA L'HOMMEDIEU, ESQ.*

VICE-PRESIDENT OF THE CORPORATION.

THE ſcarcity of timber in many parts of this ſtate for fencing where there are no ſtones for walls, has greatly affected the price of land, and farmers will ſoon be in a very diſagreeable ſituation unleſs ſome expedient be found for fencing their farms at a cheaper rate, in the old ſettled parts of the country, than is at preſent practiſed. In many parts of the new ſettlements too there is but very little timber ſuitable for fencing the inconveniences of which will ſoon be felt by the inhabitants. In conſidering this ſubject it will readily occur that Ditches and Hedges can be the only ſubſtitute where there is no ſtone. It will be worth the attention of this Society to get information of the beſt method of making Ditches and raiſing Hedges, that the ſame may be communicated for the benefit of the public. This ſubject is much talked of by farmers; but ſince the deſtruction of the *prim* and the *Engliſh black thorn*, few attempts have been made to raiſe hedges in any manner whatever. In the town of Eaſt Hampton, in Suffolk county, by the beſt computation, at leaſt two hundred miles of good prim-hedge died in the courſe of two or three years, which was a greater loſs to the inhabitants than if every houſe in the townſhip had been burnt down at the time; it has not as yet been diſcovered what occaſioned the deſtruction of the prim-

The Engliſh black thorn in Southampton was nearly equal to the prim in Eaſt Hampton: This has lately all died there, as it has in every other part of the country where it grew. A certain fly makes a hole thro' the bark of the thorn, and there depoſits its eggs or maggots; the ſap of the thorn runs out at this hole and hardens on the bark, and becomes a hard bunch round the limb, and prevents all circulation of the ſap or juices in that part, and intirely kills the limb; this being the caſe in the different branches from the ſame ſtock, the whole is ſoon deſtroyed. There are frequently three or four of theſe maggots in one bunch; they grow near half an inch long before they become a fly. They have alſo by the ſame means deſtroyed all the plumb and damſon trees on the Eaſt end of Long-Iſland; and have lately began on the cherry-trees, eſpecially on the black cherry, which was ſet in ditches and bade fair to make good hedges, and in a ſhort time will probably kill the whole; and it is to be feared that they will increaſe and deſtroy all our cherry trees, tho' I have not ſeen any large trees injured by them as yet. Where the prim and thorn hedges were deſtroyed no ſubſtitute has been attempted. Where poſt and rail fence cannot be got the ditches are kept up, and with ſtakes and poles on the top a temporary fence is made. It is difficult to ſay what would be the beſt thing for a hedge that we can depend on: The thorn of this country would make an excellent hedge, far ſuperior to the Engliſh white thorn, but we have not as yet been able to raiſe it from the ſeed or haws.

If we may judge by the great mortality of the prim and Engliſh black thorn, the thorn of this country will not be ſo liable to diſorders as ſhrubs which are imported from Europe. It anſwers but little purpoſe to have ditches unleſs you have hedges to ſupport them. The wild cherry is of quick growth, and bears lopping, but is eaſily deſtroyed by cattle who are fond of the leaves; this is the caſe with the locuſt tree. It is found that where lands have been cleared, and young oaks, walnut, or any other trees that will bear lopping, have been left, they have anſwered well for a hedge by lopping the ſame on a ditch, and is a good fence againſt cattle and ſheep. I would recommend the ſetting out any kind of young trees, that will bear lopping, of two or three feet in length, which will be fit to lop on the ditch two or three years ſooner than if raiſed from the ſeed. I have lately gone into this practice, and make no doubt of its ſucceſs. If the pomace of apples is ſcattered in ditches, the ſeed will come up, and if kept from the cattle a few years, will be ſufficiently grown to expoſe to cattle, who will bite the tops, and prevent their growing higher; they will then grow thick and thorny, and make a very good hedge. Laſt year I ſtrewed all my pomace in ditches for this purpoſe. I have ſeen young apple trees put in a ditch, that is, the bank, between the ſods or turfs, when the ditch or bank was making: they grew well, and being expoſed to cattle, became a good hedge, and well ſupported the bank.

ON

# IMPROVING POOR LANDS,

BY

# SOWING RED CLOVER-SEED:

*BY EZRA L'HOMMEDIEU,* ESQ.

VICE-PRESIDENT OF THE CORPORATION.

SOME years ago, I saw a piece of very poor loomy land, grown over with moss, and yielding no pasture except *five-fingers* and a few daisies; it was ploughed up early in the spring and sowed with nothing but red clover-seed, four quarts to the acre. The next year it produced a considerable quantity of hay, which was the only crop, tho' the land was much better afterwards. I make no doubt but this mode of culture might be improved to great advantage. It is the only instance I have seen of clover seed being sown alone on any land. It is commonly said that the sowing of this seed will answer no purpose on very poor land; perhaps the reason is that wheat, rye, oats, or something else, is sown at the same time, which exhausts all the strength of the land to bring it to perfection, and leaves the clover that comes up in so weak and languid a state, that it eventually comes to nothing; when if the clover had all the nourishment the land was capable of affording, it might

produce a ſufficiency of ſeed the firſt year to pay for the ſeed ſown and the tillage; and the next year a conſiderable crop of hay, which would be a clear profit; and if the lands were ploughed up the next ſpring after cutting the hay, while the roots of the graſs were alive, it would ſo inrich the land that in the next proceſs the ſeed and hay would be much increaſed, and by continuing this mode of culture the lands would be made good without further manure. I would propoſe that the advantages of this mode of improving poor lands be aſcertained by experiments to be made on different ſoils by gentlemen of the Society who are farmers.

## ON THE ADVANTAGES OF RAISING THE LEUCANTHEMUM, OR GREAT COMMON DAISY,

*By EZRA L'HOMMEDIEU, ESQ.*

I AM fully ſenſible of the prejudices of farmers in general againſt this plant, and of the expence and labour which have been judged neceſſary to deſtroy it. I have known many farmers take great pains to eradicate it, when the preſent occupiers, their children, ſow many buſhels of the ſeed every year on the ſame farm; while the land remained good and would produce white clover. After cropping, this plant no doubt was not ſo beneficial as the clover; but after the lands were reduced ſo low as not to produce graſs equal to the daiſy —in many parts of the country the averſion againſt it was ſtill continued, and is ſo to this day—though I am fully ſatisfied by experience and obſervation, that upon old worn out lands it is the moſt profitable plant that is propagated on Long-Iſland. This year I intend ſowing ſix buſhels of the ſeed on poor light land, now ſowed with wheat, which probably will produce about ſeven or eight buſhels to the acre. This plant affords very good food for ſheep and cattle; it makes good butter, and if it is not paſtured, makes hay, (if cut in ſeaſon while in the bloom and well cured) equal to clover. Horſes, horn cattle and ſheep eat it as readily as any other hay. I had much rather have a load of this hay than one of coarſe red clover; the

advantages of propagating it on poor lands are many—1ſt. Lands which will produce this hay may not be ſtrong enough to produce any other—2d. Poor land will produce much more paſture with this plant than any other—3d. Sheep and cattle are very fond of it, while it is young—4th. It is not eaſily affected by a drought; this makes it peculiarly advantageous to Long-Iſland, which from its ſituation is more ſubject to drought than moſt other parts of the country; when other paſtures are dried up this remains green and flouriſhing—5th. It is never affected by grubs or other worms; when whole fields of other graſs are deſtroyed by worms, the daiſy receives no injury from them—6th. It is favourable to a crop of wheat, and if you chooſe to turn your daiſy-field to a clover-field, you have nothing to do but manure it well, which will deſtroy all the daiſies. It yields much ſeed, and is commonly ſold for about four ſhillings per buſhel tho' not well cleaned. Some people ſtrew the ſeed on poor lands without ploughing; this anſwers ſome purpoſe, but the beſt practice is to plough the poor lands for wheat or rye, and ſow the daiſy ſeed either with the grain or early in the next ſpring, as may be moſt convenient. About three quarts of clean ſeed will be ſufficient for an acre.

ON THE

# FOLDING OF SHEEP:

*BY EZRA L'HOMMEDIEU, Esq.*

ON obſerving that ſheep kept by ſhepherds in flocks, and folded every night, for the purpoſe of manuring land, were poor and ſmall, compared to others which were kept in no better paſtures, and not folded, I determined to make an experiment of the profits which might ariſe to the farmer by folding his flocks of ſheep, which I concluded might be advantageous, if properly conducted; for this purpoſe, on the firſt day of June, the year before laſt, I fenced and ploughed up one acre in a field which contained about ſeventy acres, and on which were kept eighty grown ſheep, and ſixty lambs. I concluded that if the ſheep were folded every night at ſun-down, and let out every morning by ſun-riſe, the ſheep would not be much injured, the crop of wheat propoſed to be raiſed on the acre, would be conſiderable, and the land much improved, which then was very poor.

The ſheep were properly attended to, which was eaſy to be done, as the fold was in the ſheep-paſture, and the farm houſe not more than twenty rods from the fold. I ſoon

diſcovered, after folding the ſheep, which began about the middle of June, that they did not look ſo well as uſual, and was adviſed by the overſeer to diſcontinue the practice: I determined however to make the experiment, and continued the folding till the firſt of Anguſt. After which the ground was ſowed with wheat, ſome turnip-ſeed and red clover-ſeed. The lambs were ſo much injured by the practice, that they ſold for one ſhilling leſs on an average than thoſe which were raiſed on the ſame paſture before and ſince; and the grown ſheep ſuffered ſo much, that by the beſt judgment I could make, by conſidering their being poorer than otherwiſe they would have been, and calculating the reduced quantity of wool which they yielded the next ſpring, that the average loſs was two ſhillings on each grown ſheep. The wheat was hurt by the winter, though had it not been for this circumſtance, by computing that part which was not winter killed, the product would have been fifteen buſhels. Sixty buſhels of turnips were pulled from the ſame ground, and I expected that the land would have been ſo improved as to produce a good crop of hay the next year, but in this I was diſappointed; the wheat and the turnips having exhauſted almoſt the whole of the manure which was obtained by the ſheep, and the land left in a ſtate not much ſuperior to what it was at firſt.

Computation of PROFIT and Loss.

| | £. | s. | d. |
|---|---|---|---|
| Ploughing, ſowing, and reaping the acre, . . | 1 | 10 | 0 |
| Pulling and cutting the turnips, . . . . . | 0 | 10 | 0 |
| Loſs on eighty grown ſheep, at 2s. . . . . | 8 | 0 | 0 |
| Loſs on ſixty lambs, at 1s. . . . . | 3 | 0 | 0 |
| Attending the ſheep, . . . . . | 0 | 8 | 0 |
| | £. 13 | 8 | 0 |

PRODUCE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Fifteen buſhels of wheat, in caſe no part had been winter-killed, at 8s. . . . . | 6 | 0 | 0 | | | |
| Sixty buſhels of turnips, at 1s. 6d. . | 4 | 10 | 0 | | | |
| | | | | 10 | 10 | 0 |
| Loſs, . . . . . | | | | £. 2 | 18 | 0 |

By this experiment I was convinced no advantage would ariſe from the conſtant folding of ſheep. The injury done to the ſheep by folding, appears to ariſe from a number of cauſes. They became very dirty by lying on ploughed ground, which muſt check their uſual perſpiration. Their noſtrils are alſo affected by the duſt which is taken in with their breath, and their reſpiration impeded, which with the breath of ſo many lying cloſe together, muſt be unfavourable to their health. But the principal cauſe I apprehend, ariſes from their being prevented from feeding at pleaſure, when the dew is on the graſs, when it affords the greateſt nouriſhment. Sheep ſeldom feed in the middle of the day, and drink but very little, which I conclude is owing to their feeding

principally while the graſs is moiſtened by the dew. I am induced to believe this, becauſe it is found by experience, that a horſe, by being accuſtomed to go in a paſture without water, will ſoon learn to eat while the dew is on the ground, and will thrive as well as if he could go to water whenever he choſe. It is alſo found by experience, that calves will do better in a paſture without water, than in a paſture of equal goodneſs with water. This experiment, with the reaſons, I propoſe to communicate to the Society at their next meeting.

ON

# RAISING CALVES:

*BY EZRA L'HOMMEDIEU, Esq.*

IN raiſing horned cattle, it is of great importance that the calves be weaned and kept through the ſummer in the beſt manner: If this is not attended to, and they become poor or pot-bellied, it is with difficulty they can be put in a thriving condition, and in general will never recover ſo as to equal thoſe which have not been checked in their early growth. Calves taken from the cows are generally kept in paſtures where there is plenty of water, and a paſture where there is water, is preferred to one much better where there is no water; but by obſervation, I am convinced that this practice is wrong, and that calves taken from the cows wean much better in a paſture without water, than in a paſture of equal goodneſs with water. Laſt year I ſaw in a paſture without water, more than twenty calves, in which they had been kept without drinking from the time of their being taken from the cows till ſometime in the fall: I frequently ſaw them and obſerved them more attentively, on account of the particular manner in which they were kept; they were all thrifty and remarkably gaunt or ſmall bellied, which the owner (a gentleman of Suffolk

county) imputed to their not having water; and obſerved that he never had calves do ſo well before—and his obſervations on the ſubject very well accounted for the facts. He ſuppoſed that calves accuſtomed to get their ſupport from milk (being a liquid) when they are ſeparated from the cows, and put in a paſture where there is water, after becoming very hungry and dry, betake themſelves to water, which being a liquid, and more ſimilar to what they have been accuſtomed to, than graſs, they drink and drink again, till they appear round and full; but this not being ſufficient to ſupport nature, after falling away conſiderably, they eat a little graſs, and that principally in the day-time, which does not alleviate their thirſt, ſo as to prevent their drinking too much. But on the other hand, when there is no water in the paſture, the calves, preſſed by hunger, are obliged to feed on graſs which contains ſome moiſture, and ſoon learn to allay their thirſt by eating while the dew is on, and for the ſake of the moiſture or dew on the graſs, eat much more than they would do, if they could go to water, and ſoon get accuſtomed to feed chiefly in the night and in the morning, before the dews are exhaled. By this practice you will ſee no pot-bellied calves, which is occaſioned by drinking too much, and eating too little: this too brings on poverty in fleſh, which produces lice, and the lice prevent the thriving and growth of the calves till their coat of hair is ſhed the enſuing ſpring, one or two other facts, which I ſhall relate. From this and

I am induced to believe that there is ſomething more nouriſhing in dew than is commonly imagined. On obſerving a horſe owned by a perſon in my neighbourhood, for a number of years, to be very fat in the ſummer ſeaſon, although it was the only horſe the owner had, and was worked ſteadily, and went in very poor paſture, I aſked the owner by what means he kept his horſe ſo much fatter than his neighbours, who made uſe of much better paſtures. He informed me that he gave the horſe no grain of any kind, but kept him in a very poor paſture adjoining a creek where creek-thatch grew on ſand-flats: that the horſe got but very little from the upland, but fed on the thatch at nights and in the mornings, while the dew remained, but after the dew was exhaled, he would eat no more of the thatch, but return to the upland, and if at liberty, would take his reſt the bigger part of the day.

Horſes in general will not eat this thatch, and it is very poor fodder for cattle, although it anſwers with the help of other fodder, to keep them through the winter. The owner further informed me, that before his horſe had learnt to feed on thatch, which was two ſeaſons, he continued to be quite poor in the paſture in which he then went. No perſon acquainted with this ſedge, will ſuppoſe that a horſe can be kept on it in any tolerable order, with common water; and it muſt be ſuppoſed that the dew added very materially to the nouriſhment of the horſe.

It is obſervable, that the dew in ſummer, frequently has a ſweet taſte, not very diſſimilar from honey, and is called a honey-dew. It is probable that all dew has more or leſs of thoſe particles, and affords very conſiderable nouriſhment to animals in general.

# ESSAY

ON SOME

# PERENNIAL GRASSES;

WITH THE MOST APPROVED METHOD OF THEIR CULTIVATION, AND VARIOUS REFERENCES TO THEIR PROPER SOIL:

*By PETER DELABIGARRE, Esq.*

NON OMNIS FERT OMNIA TELLUS. *VIRG.*

AMONGST a great number of graſſes uſed for artificial paſtures, I thought it my duty to ſelect thoſe which I preſume the moſt ſuitable to this State, and moſt friendly to cattle, as far as I am able to judge, from my experience of the country.

| | | |
|---|---|---|
| LUCERNE, | ESPARCET, | CLOVER, |
| SAINFOIN, | PIMPERNEL, | VETCHES. |

This Eſſay will be extended only to four of the perennial, conſidering the three others as annual, and leſs uſeful, which therefore require a ſeparate treatiſe.

## LUCERNE.

It is not true that lucerne can grow every where: it requires a light, but ſubſtantial ground, not too dry nor too wet: it delights in a deep and gravelly ſoil, or rich ſand,

where it may root down eaſily, rather upon a level ſpot, than on mountains or declivities. As much as poſſible I would chuſe a ſituation ſheltered by woods or hedges from the cold winds in the winter, and from burning breezes in the ſummer.

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TILLAGE AND SOWING.

The ground intended for lucerne, muſt be ploughed twice before the winter, fifteen inches, or at leaſt a foot deep.

In the latter end of March you plough it again, and dreſs it with a harrow before the day of ſowing: the ſeed is buried in the ground by the harrow, taking care to fix chatwood or branches under and betwixt the teeth, in ſuch way as to facilitate the covering of the ſeed, without going too deep into the ground.

There are two ways for the ſowing of lucerne: the firſt, by itſelf, which is the beſt: the ſecond, mixed with barley or oats—but obſerve not to mix lucerne with any other perennial.

Whether lucerne is ſown by itſelf, or mixed with barley, take twenty pounds weight for an acre. If you chuſe to ſow it with barley, take the exact meaſure of the quantity of barley which you are uſed to ſow upon one acre—then put in that meaſure twenty pounds of lucerne ſeed, and

fill it up afterwards with the barley, that proceſs will eſtabliſh the juſt proportion.

If you intend to ſow lucerne by itſelf, fill up the meaſure with ſand or aſhes over the above-mentioned quantity of ſeed, that method makes the ſowing eaſier and more regular.

When your barley is ripe, you may mow it as cloſe as poſſible to the ground without any danger of hurting the young plants of your lucerne, of which you cannot expect but a very indifferent crop that firſt year. Don't let cattle feed upon it at that time.

The ſecond year will give you two crops. In the beginning of the third year, as ſoon as the winter is over, you muſt harrow your lucerne about two inches deep when the ground is yet moiſt, in two or three different directions, in order to root out the weeds: Never mind nor be uneaſy if your lucerne is torn to pieces by that hard dreſſing; the more it is torn the better it will grow: this is a fact of long experience, upon which you may rely.

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MANURE.

AFTER the above dreſſing, you may manure your lucerne with greater advantage, by ſpreading over ſome new ground or mud taken from creeks and ſwamps, or employ ſome pulverized gypſum.

The beſt manure for lucerne which I know, is the dung of fowls and pidgeon-houſes, well dried by the ſun, and reduced into powder; but it ſeems very ſcarce, and too difficult to be got in this country, although a great deal leſs of this laſt manure would be required, as in the proportion of one to nine. Dung of cows, horſes, or of any other cattle, ought to be rejected as bad manure, upon lucerne—becauſe they bring with them ſuch a quantity of weeds, as to poiſon the beſt lucerne in the courſe of two years.

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PRODUCE.

The third year the lucerne has acquired its full ſtrength, then upon a common average one acre will produce, *viz.*

| | | |
|---|---|---|
| The firſt crop, . . . . . | 2500 | weight. |
| The ſecond, . . . . . | 1400 | do. |
| The third, . . . . . | 600 | do. |

After the third crop, let it be fed upon by your cows all the remainder of the fall.

Such a piece of lucerne will laſt from nine to ten years: but however great may appear the profit of that culture, there is a greater one after the lucerne is worn out: I mean the richneſs afforded to the ground by the roots of that plant: which is ſuch, that the firſt year the lucerne has been ploughed up, I was never able to raiſe wheat, which grew too rich, tall,

luxuriant, and lodging. Inſtead of wheat, then you muſt ſow barley or oats.

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MOWING.

The moſt proper time to get good and tender forage, reliſhed by the cattle, is to mow lucerne when in full bloſſom, or a little before the ripeneſs of the ſeed.

Another advantage of mowing early, is to have the weeds cut down, which otherwiſe would come to ſeed, and ſpread over the field.

When the weather is clear, one or two days are ſufficient to dry your lucerne hay; and by ſpreading over each row a thin bed of any ſtraw—(that of oats and barley is the beſt) you may carry your lucerne to the barn, without any danger of being heated or rotten. The ſtraw ſo intermixed with lucerne, receiving the juicy emanations of it, becomes more palatable, and it is eaten like the beſt hay by the cattle. It would be needleſs to obſerve what increaſe of food that proceſs affords to a farm.

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DISORDER.

In ſome uncommon ſummers, it happens that lucerne is attacked by caterpillars, or other inſects. When this is the caſe, and you perceive the ſtems and the leaves turning pale, yellow, or fading, the only and beſt remedy is to mow inſtantly

your lucerne, which will ſoon grow again, fine and free from thoſe inſects.

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### SAINFOIN.

It may be aſcertained that ſainfoin, conſidered like hay, is one of the moſt friendly foods to neat cattle; horſes are particularly fond of it in the winter, when it furniſhes them ſo ſtrong a nouriſhment as to be a good ſubſtitute for oats.

It grows upon any kind of ſoil, except upon ſtony ground. Its moſt advantageous quality is to ſucceed in the pooreſt land, ſandy loam, and upon declivities, of which it keeps the ground.

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### TILLAGE AND SOWING.

Two tillages as deep as poſſible, according to the nature of the ground; never mind if the plough turns up a part of that reddiſh and yellow ſtratum which they call unvegetable among the farmers.

It is ſown by itſelf, or mixed with the ſame grains pointed out for lucerne: but as the ſeed of ſainfoin is bigger than that of lucerne, the mixture muſt be in proportion.

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### MANURE.

Any kind of well-rotten dung, or any pulverized gypſum, will increaſe the crops, though it may do without. When

it is three or four years old, a good harrow-ſcratching cannot fail to be of ſervice.

PRODUCE.

It will be according to the ſoil, commonly two crops. The firſt richer than that of any other graſs: The ſecond leſſer in the proportion of one to nine—becauſe you cannot mow the ſainfoin as early as you do lucerne. If you wiſh to make a ſtrong food for your horſes, you muſt wait till it is grown up in ſeed for the firſt crop.

MOWING.

I would recommend the method pointed out for lucerne, as the moſt profitable.

LONGEVITY.

Sainfoin is in full ſtrength the third year, and will laſt from nine to twelve years, ſometimes more, according to the ſoil and expoſition.

DISORDER.

It is not liable to be deſtroyed by any kind of inſect, as far as I know from an experience of fifteen years. Its mortal enemy is a flock of ſheep, particularly when it is young.

ESPARCET.

This graſs, unknown I believe in England, may be claſſed among the plants of perennial kind, and more like the ſainfoin

than any other. It has ſome peculiar advantages—It may be ſown in every month of the year, except in time of ſnow or froſt, growing upon every ſoil, it roots very well through ſtiff clay, ſtony or hard red gravel, provided the ground has been ploughed as deep as poſſible.

MANURE

Like for ſainfoin.

PRODUCE, MOWING, &c.

Though it would afford a crop nearly like that of ſainfoin, I preferred keeping it for conſtant paſture; and in that way I have ſeen one of twenty-three years old, producing as fine graſs as any young meadow. It is remarkable for keeping well the ground upon declivities.—No Diſorder.

PIMPERNEL.

This perennial plant, which I would rather call immortal, on account of its long continuance, highly deſerves to be introduced into this country. It is capable of withſtanding the ſevereſt cold, as well as heat; beſides it grows as well upon the top of mountains as in plains and valleys: it delights above all in light, ſandy, gravelly or calcarious ſoils. This vivacious plant has the power of deſtroying every other kind of graſs or weeds. It keeps green all the winter, and the cattle are ſo fond of it, that whenever they ſmell it, they ſoon remove the

ſnow to get at it. Whether eaten dry, green, or wet, it never hurts the cattle: Its nutritive qualities differ from thoſe of other plants of the ſame claſs; for inſtead of heating, it refreſhes. Give me leave to ſubmit to you a ſingle inſtance, recommending this plant better than any other deſcription.

In the province of Berri it was known and remarked long ago, that all the ſheep who fed upon certain meadows full of wild pimpernel, had finer wool. In conſequence, a gentleman of my acquaintance took the trouble to cultivate a piece of ground with that pimpernel, and his ſucceſs has confirmed beyond any doubt our preceding remark. He bought twenty poor wretched ſheep, who never had before but coarſe and common wool. In the courſe of the firſt year the alteration in the wool was ſenſible, and the little flock was bearing a good and healthy appearance. Not further than at the third ſhearing, the wool was ſo fine that it fetched one-fifth above the common price.

In ſhort, this plant, whether as hay or in graſs, affords the moſt reliſhing food to horſes and cows; theſe laſt give much better milk.

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### TILLAGE AND SOWING.

The ground muſt be well ploughed at leaſt ſix inches deep, once in the latter end of September, the ſecond time in October. Then twelve pounds of ſeed will do for an acre,

if the ground is good :—add to it as much ſand or aſhes, and ſow it as you do lucerne.

MANURE.

It may do without, but gypſum and any kind of dung would by all means increaſe the crops.

Like lucerne, this graſs will receive a great benefit, by being ſcratched with a harrow, every other year in the beginning of March.

PRODUCE,

Commonly three crops, like lucerne, if it is reſerved for hay.

MOWING,

Like lucerne.

DISORDER,

None, as far as I know.

LONGEVITY,

Immortal.

# EXCURSIONS

ON

# OUR BLUE MOUNTAINS:

*By PETER DELABIGARRE, Esq.*

AGENT OF THE FRENCH REPUBLIC AT NEW-YORK.

STIMULATED by the ſtrongeſt deſire of paying my ſhare to your uſeful or curious diſquiſitions, tending to enlarge the natural hiſtory of this State, I beg leave to lay before you my firſt excurſions on that ridge of mountains oppoſite Redhook Landing, commonly called Catſkill, or Blue Mountains. I do not preſume to give you at preſent an accurate or complete deſcription of the many curioſities, plants, trees, and minerals, unexplored in that wild part; to obtain which, would require more time and knowledge than I could apply to ſuch extenſive reſearches laſt year—thus the only merit of this communication is the novelty of many objects, and a ſketch of my zeal.

The 9th of April, 1793, at 11 o'clock, A. M. calm and clear weather, I was at the foot of that part of the mountains due weſt of Redhook landing: the firſt aſcent, to the height of four hundred feet, is very eaſy and gradual: there ſome banks of rocks run laterally and in a ſemi-circular line round the ſide of the mountain, riſing a little higher towards the

ſouth, like the firſt walls ſupporting the upper ground. All over theſe rocks of hard free-ſtones, there is a ſufficient quantity of vegetable earth to cover them with trees ſimilar to thoſe of the lower ground. I was much ſurpriſed at finding not a ſingle run of water from that place to the ſummit of the mountain, which I reached after many hard windings: Almoſt choaked by the heat of the day, and the difficulty of my aſcent, I felt myſelf very diſtreſſed; but taking a turn to the north ſide, I was relieved by ſome heaps of remaining ſnow, which, melted with brandy, afforded me a delicious drinking, tenfold better than any ice-cream.

My elevation then was about 2,800 feet above the level of the river; and at four o'clock being on the higheſt top, I had the pleaſure of contemplating a moſt magnificent proſpect all around the compaſs.

That large river, which I could hardly croſs in half an hour, appeared like a rivulet: a ſloop was no more than a ſmall canoe rigged with a blanket. What was become of thoſe lands, places and buildings, left in the morning? Was I able to perceive then any of thoſe buſy people riding on the roads, or working in their fields? Could I diſtinguiſh the rich abode from the humble cottage? Could I hear the noiſe of a buſtling world? No: the whole of it was confounded in the vaſt horizon before my eyes, like a grain of ſand at my feet. I will not attempt to deſcribe the elevated and noble ideas then

excited in any mind for fear of attenuating THE GREAT by a little picture!

The top of the mountain is covered with evergreen, pitch, and white pines, hemlock, ſpruce, and large ſilver fir trees: Lower down on each ſide, are ſugar-maple, beech, aſh, birch, oak, and elm trees. The underwood is compoſed of many ſhrubs like thoſe of the other mountains, except that there is a greater number of wild currants, gooſeberries, raſberries, than any where elſe. In ſome ſhaded places I diſcovered a kind of liquorice very much reſembling that of Italy, as to the taſte of the root.

I obſerved with ſome pleaſure that the ſouth-ſide of the mountain is full of fox and winter grapes, upon which I make no doubt the bears make a pretty good vintage every fall. It confirms my former ideas on the poſſibility of cultivating the grape in this country with as much ſucceſs as in Europe. Though it would be uſeleſs, and by no means deſirable, to anticipate the time, we may foreſee that a day will come when neceſſity with her iron rod, ſhall compel the more numerous Americans to cultivate theſe wild gifts of a rude but beautiful nature—then Madeira will give place to the Blue Mountain-claret.

A fact well worth our remark, is, that the vegetation, particularly on the ſouth expoſure, was as forward as on the eaſt ſide of the river, if not more ſo. Behind the higheſt top

above-mentioned, in a due courſe to the weſt, I diſcovered two ſmall lakes, one almoſt perpendicularly down in a kind of deep hollow, the other about three miles farther in the ſame direction.—Before I could attempt to viſit the firſt lake, I was invited to recover myſelf from my fatigue upon ſome proviſions brought along; then ſitting on the edge of a pure and limpid ſtream running to the ſouth-weſt, I made the moſt happy repaſt in all my life: No luxuries, no ſpices, not the moſt refined cook could ever make me eat with ſuch reliſh as I did ſome bread and butter in that moment. I quitted my ſtream with a thankful heart.—Taking my courſe to the weſt, I had to deſcend for two hours, being obliged in ſome places to jump ten feet from rock to rock; ſo in that mode of flying down, I could not help recollecting the fate of the raſh and unfortunate Icarus.

The lake is of an exact circular form; the bottom very ſhallow, is of a reddiſh ſand, intermixed with looſe black ſtones, of the ſlate kind: Several ſmall ſtreams, which give origin to the lake, carry a great quantity of iron ore. In that dark receſs I was obliged to encamp for the night, laying on branches of hemlock. I was awakened from time to time (for the ſake of variety) by the howlings of wolves, wild cats, and bears: One of my men, though overcome with fatigue, and very ſleepy, diverted me very much by his fears, keeping conſtantly in his hand a ſmall hatchet, to defend imſelf againſt our ſurrounding muſicians.

Up before the ſun, (as you may imagine my curtains could not intercept even the dawn of the day), I took a north-eaſt courſe, in order not to come back by the ſame way I went up. At nine o'clock, A. M. I fell in with the head of that large hollow oppoſite to the Chancellor's houſe; and diſcovering an extenſive vale to the north of my courſe, I clambered up a tree to obſerve its ſituation, which appeared to me very romantic: This beautiful ſpot, of about ten miles in circumference, is entirely ſurrounded by the ſummits of mountains, riſing from five hundred to a thouſand feet above its ſurface—in the middle I could diſcover a lake; but the lofty trees growing to an immenſe height on that high ground, prevented my aſcertaining the extent of it. In my way I ſaw a great many pidgeons, not in flocks, but by couples, building their neſts in that undiſturbed part of the world. From the vale above-mentioned, runs a creek, in a direct courſe to the eaſt, deſcending into the hollow with an uncommon rapidity. I expected that by following the creek, I would find an eaſier paſs for my return, but it proved to be the moſt arduous I could meet with. However I would not give up the agreeable compenſation which I received there for my trouble. The trees are thick, tall, and a great deal larger than any where elſe. Enormous bodies rotting down, afford nouriſhment to thouſands other young trees raiſing their proud heads to the clouds: The moſt ſtupid eye is forced to look with a reſpectful awe at the eternal ſtate of deſtruction and renovation, which

a Supreme Being has impreſſed to the wheeling turn of his works! There I found a fall of the creek upwards of four hundred feet perpendicular, the ſheet twelve feet in breadth; at the bottom of that fall the mountain ſeems to be ſplit aſunder, as if to let the bold traveller look into its bowels. On the ſouth ſide of that ſtupendous gap, the top being crowned with a thick row of evergreen, never permitted the rays of the ſun to approach that cold and horrid place. Hence down to the loweſt foot of the mountain, I counted more than one hundred different falls: How often I was looking back at thoſe beautiful trees on each ſide of the creek with a painful eye, regretting that it ſhould be impoſſible to get at them! So they muſt grow and die, uſeleſs to mankind.

My curioſity being excited by this excurſion, I took another the 26th of laſt July, in company with a natural philoſopher; to aſcertain with proper inſtruments the heights of our Blue Mountains. We ſet off at 8 o'clock, A. M. thermometer 71 degrees, barometer 30 inches, clear weather, wind north; our courſe to the north-weſt. When at the foot of the mountains, where the new road to Scoharykill begins, ten miles from the river, we found that we had aſcended only 427 feet above the level of the river. Several romantic ſituations on the new road deſerve to be ſeen—I will mention one in particular:

About half way ſtands an enormous rock of one piece, cut ſmooth in its perpendicular front like the pane of an old

fortification; that front covered with a fine moſs, repreſents a green carpet, and at the height of ſix feet, comes out of the rock a ſpout of water, three inches diameter, as if Nature has intended to offer that refreſhment to the thriſty traveller.

At four o'clock we were at the two ſmall lakes, between which the road paſſes, 2015 feet above the level of the river. Theſe lakes are of an irregular oblong form, one mile in length, and the fifth part of a mile in breadth: Upon an exact ſounding, we found no more than four feet of water in the deepeſt parts. The bottom is a ſolid rock, covered in ſome places by looſe ſlate ſtones: there is no fiſh but a few ſuckers; we ſuppoſe with ſome degree of probability, that they are continually deſtroyed by a great number of muſkrats, who have an old ſettlement in the middle of the water, where ſeveral of their buildings riſe two feet above its ſurface. We ſaw a kind of creeping plant adrift on the ſhore, unknown and undeſcribed: It is of a ſpungy nature, ſoft when in the water, and as hard as cork when dry; it looks very much like an old rope. Was ſuch thing found on Mount Ararat, a credulous Jew would directly take it to be ſome remains of the rigging of the ark of Noah. That plant is from one to two inches diameter, of a black colour; and till it is better known, we are pleaſed to call it *the vegetable rope.* Though a ſolid cauſeway 20 yards wide divides the two lakes, the upper empties into the lower by a little canal cut through the rocks by the hand of nature; the evergreens all around,

add a very romantic appearance to that ſpot where we reſted for the night, under the ruins of an old log-houſe.

The 27th, A. M. we followed the ſtream, coming out of the lower lake, and running to the north-weſt: at the diſtance of two miles, it is increaſed by two other ſtreams, and ſoon after makes a noble fall about 300 feet perpendicular; it ruſhes down with ſuch an impetuoſity, that the body of water twiſting itſelf in a ſpiral vortex, is in a great meaſure evaporated before it reaches the bottom of the precipice. This natural curioſity had been viſited by our Preſident, as we could ſee his cypher engraved on a birch tree ſtanding on the edge of that tremendous fall: on the north ſide we ſaw a large quarry of black ſlate ſtones of the fineſt grain; we had a ſtrong deſire to explore the bottom of ſuch a precipice, in order to aſcertain more accurately its depth; but conſidering the riſk of breaking our inſtruments in that difficult deſcent, we took our courſe to the north, then meeting with the new road, and turning to the weſt, we were ſoon gratified by a ſight of a different nature.

Among ſome new ſettlements in the middle of that wilderneſs, one attracted our particular notice: we were welcomed with that cordial hoſpitality which ſeems peculiar to new ſettlers; our hoſt, not above 20 years old, entertained us with particulars on the ſoil, temperature, and various ſubjects of agriculture, whilſt his amiable conſort, only 15 years old, was preparing

the dinner with a charming cheerfulneſs: the neatneſs of their log-houſe and their manners, recalled to my mind the picture of the golden age: then I wiſhed for a moment to be a Jupiter, in order to beſtow on this young couple the reward formerly granted to Philemon and Baucis; but without having recourſe to the fables of antiquity, let me expreſs here my natural wiſh: May they never feel the bitter cares of a large ſociety; may their preſent happineſs never be diſturbed by envious or ill-minded neighbours!

We were obliged to come back to our lakes, as the neareſt place for our next excurſion. The 28th we ſet off in a direct courſe to the ſouth, in order to reach the higheſt ſummit of all that body of mountain. That ſummit is diſtinguiſhed from the river by its circular form in the ſhape of a cap, and we took upon us to call it LIBERTY CAP. In our way we found ſeveral ridges entirely compoſed of granites, which are glutined by a ſofter cement than any that we had ſeen before: the baſe of ſome ſtrata is ſo much undermined, as to form large vaults which could ſhelter more than twenty people at once: for my part I own that I would rather be expoſed to any ſtorm, than to truſt my life to ſuch place-threatening ruin every moment. We expected to diſcover ſome ſhells or marine bodies among thoſe granites; we paid a particular attention to that reſearch—we ventured ourſelves even into dangerous gaps, but to no other purpoſe than to be convinced that thoſe ſhells

and marine ſubſtances ſo common on the mountains of Europe, are not to be found here. This ſingular circumſtance ſeems to prove, that this New World has not experienced the ravages of the flood; conſequently that it is more ancient than it has been repreſented by many illuſtrious writers, Buffon, Abbé Raynal, &c.*

When I ſay that this part of the globe has not experienced the flood pretty well authenticated for ſome other part, I do not pretend to eſtabliſh that it has been always free from a precedent or a partial deluge; and in that caſe I would ſuppoſe it to have taken place three or four thouſand years before the latter: Becauſe in ſuch long proceſs of time, all the ſhells or marine ſubſtances muſt have been triturated, waſhed away, or finally diſſolved, ſo as to leave not any

* Mr. Jefferſon's notes on the ſtate of Virginia, p. 164 and 165, ſeem to corroborate my opinion. "But imperfect as is our knowledge of the tongues ſpoken in America, it ſuffices to diſcover the following remarkable fact: Arranging them under the radical ones to which they may be palpably traced, and doing the ſame by thoſe of the Red Men of Aſia, there will be found probably twenty in America, for one in Aſia, of thoſe radical languages, ſo called, becauſe if they were ever the ſame, they have loſt all reſemblance to one another. A ſeparation into dialects may be the work of a few ages only; but for two dialects to recede from one another till they have loſt all veſtiges of their common origin, muſt require an immenſe courſe of time, *perhaps not leſs than many people give to the age of the earth. A greater number of thoſe radical changes of language having taken place among the Red Men of America, proves them of greater antiquity than thoſe of Aſia.*"

other veſtige than the impreſſion of ſuch ſhells on the various ſtones which we may diſcover at the foot of our mountains.*

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* There are, it is true, impreſſions of ſhells on various ſtrata of limeſtones. Theſe impreſſions at leaſt appear to have been made by ſhells, though nothing can afford a ſatisfactory proof of the fact as long as not a ſingle particle of ſuch ſhells is to be diſcovered, nor adhering nor looſe, even by digging at a conſiderable depth into the quarries of limeſtone. On the other hand, all theſe impreſſions do not repreſent cut ſhells of one and the ſame kind. Let them be larger or ſmaller, the deſign is entirely alike. Chancellor Livingſton, upon examining theſe impreſſions, found them to be in ſhape and make, entirely like the ſcollops on the ſea-coaſts; except that they do none of them exceed half an inch in length or breadth. As they are only impreſſions on the ſtone, without any remains of the ſhells, they always take the colour of the ſtone.

Mr. Jefferſon, p. 45, brings forth ſome obſervations, which at the firſt ſight ſeem to contradict ours on this ſubject: I will relate them here, and our Readers will judge if they can ſtand any longer againſt our opinions and remarks.

" Near the eaſtern foot of the north mountain, are immenſe bodies of ſchiſt, " containing impreſſions of ſhells in a variety of forms.—I have received petrified " ſhells of very different kinds from the firſt ſources of the Kentucky, which bear " no reſemblance to any I have ever ſeen on the tide-waters. It is ſaid that " ſhells are found in the Andes in South America fifteen thouſand feet above the " level of the ocean."

1ſt. Schiſt containing only impreſſions of ſhells at the foot of a mountain, agree with us, and proves nothing againſt our own obſervations.

2d. Petrified ſhells may naturally be found in ſprings and ſources, without having recourſe to a deluge to account for them.

Leſt I ſhould be prolix on a ſubject which was not intended for communication, I ſhall haſten to conclude:

There is no other proof of a flood than the marine bodies and various ſhells found in large ſtrata on the higheſt mountains of the Old World; thus when nothing of the kind exiſts on the mountains of America, we muſt own that either the laſt flood was not univerſal, or that this part called the New World, is grown up ſince the flood.

Extricate yourſelves out of that dilemma, ye ſyſtematical philoſophers, if you can: until the matter is ſettled, we will reach our Liberty Cap where we found ourſelves three thouſand five hundred and forty-nine feet above the level of Hudſon's River.

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3d. The diſcovery of ſhells in the Andes, reſting upon a mere hear-ſay, cannot deſerve any credit. Suppoſing however the fact to be true, the ſhells may have been projected there by volcanic eruptions from the bowels of the earth near the ſea-coaſts, or correſponding with ſea-waters.

Indubitable marks and recent veſtiges of ſuch volcanoes, are exiſting yet in ſeveral places of the Andes:—thus we could call in queſtion their having been brought up at ſuch height by a deluge or flood. Upon the whole of this hear-ſay, we will refer you to this ſentence:—He is leſs remote from the truth, who believes not a report—a doubtful fact, than he who believes what is wrong.

# ON THE EXCRETORY DUCT OF THE FEET OF SHEEP:

*By ROBERT R. LIVINGSTON, Esq.*

PRESIDENT OF THE SOCIETY.

THE diſeaſes of animals and their cure, depending upon an accurate knowledge of their ſtructure, I take the liberty to mention an obſervation upon that of ſheep, which indeed was ſo obvious, that I conceived that no farmer, and much leſs the naturaliſt that treats of this uſeful animal, could be ignorant of it; 'till I found on ſpeaking on the ſubject to many experienced huſbandmen, and particularly to many members of this ſociety at a full meeting, that only one of the members had attended to the circumſtance I allude to: Nor is it noticed by Buffon, or by Liſle, who treat largely on the diſeaſes of ſheep.—This muſt be my apology to thoſe who ſhall find no novelty in the following remark: The legs of ſheep are furniſhed with a duct, which terminates in the fiſſure of the hoof; from which, when the animal is in health, there is ſecreted a white fluid, but when ſickly, theſe ducts are ſtopped by the hardening of the fluid.

I have in ſome inſtances found, that the ſheep were relieved, merely by preſſing out the hardened matter with the finger, from the orifice of the duct in each foot; perhaps it may in ſome caſes be proper to place their feet in *warm water*, or to uſe a *probe* or *hard bruſh* for cleanſing this paſſage.

May not the ill-health of ſheep in wet or muddy paſtures, be in ſome meaſure aſcribed to the neceſſity of keeping the duct I have mentioned free and open?

# LETTER

FROM

*ROBERT R. LIVINGSTON, Esq.*

PRESIDENT OF THE AGRICULTURAL SOCIETY OF NEW-YORK,

TO

*ARTHUR YOUNG, Esq.*

THE pleaſure and information I have received from your various publications on Agricultural Subjects, induce me to contribute my mite to the ſupport of your annals—a work that has given me great ſatisfaction, though many parts of it are calculated only for the meridian of England. The happineſs of man depends ſo much upon the advancement of agriculture, that every new diſcovery, every improvement by which the fruits of the earth are increaſed, ſhould be thrown into the common ſtock; and the man who has been ſo fortunate as to make them, ſhould thank God that he has been enabled, in ſome ſort, to repay to ſociety the debt he owes them for the benefit he has himſelf received from the diſcoveries of others, to the great maſs of which his own, however important, will be inſignificant.

Nothing in this view can be more repugnant to the principles of humanity and ſound philoſophy, than thoſe reſtrictive laws

by which nations endeavour to confine partial advantages to themſelves, at the expence of the reſt of mankind, who happen to be ſeparated from them by the adoption of other forms of government. The deliberate ſelfiſhneſs of ſuch national meaſures leads to the ſame ſelfiſhneſs in individuals, and, in both, ſets at defiance the great law of Chriſtianity: "Thou ſhalt love thy brother as thyſelf."

I fell into theſe reflections, by reading over the report of the committee for the inſpection of ſheep in the iſland of Great Britain;—it has greatly undeceived me with reſpect to the quality of that animal in England, which, from the high penalties on their exportation, I was led to believe infinitely ſuperior to thoſe we poſſeſs; whereas I find ours at laſt equal to the general average of thoſe in Great-Britain. Moſt of our flocks are breeding flocks, and, where tolerably kept, they average two and a half pounds of wool; where well kept, the ewes three, and the wedders five pounds; and as far as I can judge from ſuch Engliſh ſheep as I have ſeen, the wool is equal to your ſhort wool, and ſells here a quarter of a Spaniſh dollar the pound: the average weight of a fat wedder is about ſixteen pounds a quarter; were they fed through the winter, on green fodder, they would doubtleſs be much ſuperior. Thus you find that all the effect of Britiſh reſtrictions on the export of ſheep, have had no other tendency than to violate the feelings of humanity, without effecting the object they have in view: Indeed I do not know whether

every reſtriction has not a contrary effect from that intended, by ſtimulating the exertions of thoſe who think themſelves injured, and inducing them to annex an imaginary value to the obtaining of the prohibited object. We have acquired (in defiance of their laws) ſheep from England and Spain.

I have imported ſome from Holland, which are ſuperior in ſhape, though not in ſize to either; and indeed ſo greatly reſemble your drawings and deſcriptions of Baekwell's ſheep, that I am inclined to think they have made the baſis of his ſtock: they are ſhort and ſquare, without horns; the head ſmall, and free from wool; the tail ſmall and pointed, about eight inches long, covered with hair, or ſhort wool; the bones very ſmall. The ram yields ſix pounds of wool, of very good quality, and about ſix inches in length. I ſend you a ſmall ſample of wool, from a ſtock of ſheep which I received from the Weſt-Indies, and which had originally no wool, but was covered with a thick coat of red hair: this is changing into wool, which I think ſuperior in fineneſs to that of Shetland, with which I have compared it; but what is very remarkable, is, that the wool is white, though the original colour of the ſheep, and the hair intermixed with the wool, is of a mahogany colour, or what is called blood-bay in horſes. I ſhall, if you requeſt it, communicate the further alteration that theſe ſheep undergo from the change of climate, as well as the nature of the mixed ſtock, as I am croſſing them with

various breeds. If the wool ſhould retain its preſent fineneſs, when it increaſes in quantity, we ſhall not need Spaniſh ſheep to improve ours. You find by the firſt part of the proceedings of our Agricultural Society, which I directed the Secretary to tranſmit you, that we are beginning to copy your example, and to form plans for the advancement of Agriculture. The ſecond part, which is now in the preſs, will be tranſmitted to you. Since you have thought the experiments on gypſum, which I communicated to the Society, worthy a place in your annals, I would juſt inform you, that I have continued to uſe it with equal effect: but what pleaſes me more, is to find that my theory, with reſpect to its operating not merely as a ſtimulus, but actually adding, by its effects on the air, to the fertility of the earth, ſeems to be confirmed by the following experiments, the communication of which is the principal object of this letter.

For two ſummers, ſeveral farmers in my neighbourhood have applied it to the manuring of potatoes, when they have not had a ſufficiency of dung for the whole ground they had prepared for planting, and they have all aſſured me that the product was greater from the parts treated with gypſum, than from that which they had manured with dung. It is applied to the potatoes, when they are about three inches high, at the firſt hoeing, in the proportion of about ſix buſhels to the acre. I this year tried it on two fields of buck-wheat, upon

dry, ſandy ground, ſtrewing it over after the buck-wheat had attained the height of two inches. The effect upon the growth of the plant was aſtoniſhing; it averaged about four feet and a half in height, and the ſtems were of an extraordinary thickneſs. It was, however, too much lodged to produce a proportionate quantity of grain.

As both potatoes and buck-wheat are, as well as clover, of the nature of thoſe plants which draw a great proportion of their nouriſhment from the air, theſe experiments appeared favourable to my theory; but what confirms it, is a crop of oats I this year had: by ſowing the ground mentioned to be under clover, on my experiments No. 2 and 3, with oats on one ploughing, which averaged ſixty-four buſhels to the acre, notwithſtanding the natural poverty of the ſoil; and for this fertility it was certainly indebted to the clover and gypſum, which was the only manure it had; and what was very extraordinary, the three quarters of an acre No. 2, which was the pooreſt part of the field, naturally yielded better oats, as it had better clover, by nearly ten buſhels an acre, than that which was originally in much better heart.

Theſe confirmations of my theory make me regret that you had not given it a place with the experiments, ſince the principle laid down is at leaſt new, and the very refutation of it might throw light upon this moſt intereſting ſubject. The modern ſyſtem of chymiſtry, to which I own myſelf a convert,

may make new names neceſſary; but change the word Phlogiſton to *Caloric*, Vitriolic to *Sulphuric*, &c. and the theory will remain as it was, which in few words is this: —That the alkaline vapours, or gazes, which float in the atmoſphere, attach themſelves to the ſulphuric acid of the powdered gypſum, form neutral ſalts, which, being diſſolved, enter into the compoſition of plants: that the earth, deprived of its acid, becomes cauſtic, and is again reduced to a ſilenite, by re-uniting with acids in the air (moſt probably the nitric) which is re-diſſolved by alkalies, and the proceſs, thus continued till the calcarious earth is diſſolved or waſhed away, or devoured in its attenuated ſtate by plants: That theſe ſalts, in their ſolution, ſeize upon a certain portion of caloric in the air, deſtroy its elaſticity, compel it to depoſite the infinite variety of matters that are borne upon or diſſolved in it, and perhaps decompound the air itſelf, and render it, or part of it, food for plants.

I have endeavoured, by this theory, to reconcile the various phœnomenà that gypſum exhibits, as you will find, by recurring to the paper I refer to. But, after all, I conſider this as a mere ſyſtem—and, like all other ſyſtems, to be viewed as the ſport of imagination, unleſs ſo far as it ſhall appear to be confirmed by experiments.

On thus opening a correſpondence with you, who are here, Sir, conſidered as the great parent of Britiſh Agriculture, I

conform myſelf to the wiſhes of the Corporation for the Promotion of Agriculture and Uſeful Arts, eſtabliſhed in this State, in which I have the honour to preſide; as I do alſo when I aſſure you of their readineſs to communicate any information relative to the object of their inſtitution which you may think worthy of inquiry.

## TO THE AGRICULTURAL SOCIETY.

*MR. PRESIDENT,*

I AM fully ſenſible of the advantages that may reſult from ſuch a laudable inſtitution as the organization of a Society, whoſe principal buſineſs is to promote Agriculture, Manufactures, and the Arts, in this extenſive, and, in ſome meaſure, uncultivated ſtate.—Though agriculture has been my principal employment, and I have the honour of being one of the members of this Society, yet I feel every impreſſion of my inability of doing that juſtice to the ſociety, and to an employment in which a majority of the citizens are engaged, or even of coming up to the expectation of ſome, yet I ſhall, with cheerfulneſs, communicate, in the ſtile that is moſt ſuited to my common capacity, ſome obſervations and experiments that I have made on manuring of land, and the manner that the fallow ground ought to be prepared, together with ſome obſervations on manures.

Previous to the year 1787, I was induced to think that there was on every continent, or large tract of land, a ſufficient quantity of manure floating in the lower regions of the atmoſphere, in every ſeaſon, to afford a luxuriant ſupply for the production of vegetables. The ſuppoſition aroſe from the following obſervations, viz. That of the manner that hills

and knolls were ſupported, whoſe waſte by the waſh of rains are continually great; yet their ſpontaneous productions, or when well cultivated, were equal to that of level land. To ſuppoſe that they derive their ſupply wholly from the earth, as was the general received opinion, appeared an inconſiſtency; for the ſubſtances that compoſe vegetable life are of a ſubtle fluid, and of a refined volatile nature, and of conſequence the ſubterraneous heats will always keep the volatile ſalts near the ſurface of the earth; therefore, they muſt derive their ſupply from ſome other quarter, which might be accounted for after the following manner:—Low and level lands receive all the waſh, and of conſequence a fermentation will frequently take place, from the different compounds that are collected; or when that is not the caſe, the ſtrife or agitation that exiſts throughout nature, to keep up an equilibrium, will cauſe an effluvium to fly from thoſe bodies. Theſe effluvia, when taking their flight with the air, from the advantageous ſituation of the hills, a greater quantity or body of them will ſtrike or light upon it, if it is covered with trees, clover, or other vegetables, or the ground prepared; the pores of vegetables, or the cavities that are between each particle of earth, will receive them, ſhould they light on ground already charged, or on an impenetrable body; it will take its flight as the heat increaſes, and when there is not a ſufficient quantity of moiſtened or penetrable bodies to receive them, they will become peſtilential to the human ſpecies, as we have

a recent inſtance of it in one of our neighbouring cities. I likewiſe perceived, that where a heap of ſtones or rails had lain only one ſummer ſeaſon, the ſoil where they had lain was much enriched; and recollecting the manner the earth was prepared to make ſaltpetre, together with the fluctuating ſtate of vegetables, which will touch the ſenſe of ſmelling, and the corpuſcular effluviums that all bodies of manure will produce, which are the parts that compoſe vegetables, though the ſource from whence they flow are not ſenſibly in bulk diminiſhed; ſimilar to ſpirits when expoſed to the air, or hay too wet, do loſe their natural refined ſtrength and virtue. To conclude, theſe effluviums ſtill remain floating in the air, or that they returned to the earth, without reaſſuming their natural powers, carries with it ſuch an inconſiſtency, that it is not worth while, at this enlightened age, to advance one ſingle argument to confute the idea. A number of other reaſons naturally turned to view, to confirm the opinion of their exiſtence in the air, which would be unneceſſary to offer them at this time, as Chancellor Livingſton, in his obſervations, laid before this Society in the year 1792, has taken up the ſubject, and treated on it in a natural and philoſophical manner: any perſon that will candidly and carefully peruſe them, will have but little room left to doubt of the fact. The only difficulty that remained was the manner of collecting them, ſo that they might be rendered immediately

uſeful as a manure; and to effect that, I conceived that frequent ploughing might have the agreeable effect; for by frequent ploughing, the earth would be pulverized, that any fluid lighting on it would have an eaſy communication, and be much readier to penetrate the ſame; and by frequent turning up, from the bottom to the top, raw and uncharged ground, it will make a vacuum; that if any of the vegetable particles ſhould light on the ſame, it will be much readier to receive them, than that that had been already pregnated; this is demonſtrable by or from the certain quantity of common ſalt, that can only be diſſolved in a certain quantity of water, without difficulty, or by other fluids and bodies that are capable of being pregnated with fluids.

I commenced the experiment in the ſpring and ſummer ſeaſon of 1787, and have continued the ſame every ſeaſon (except one) until the preſent, and find that it has the deſired effect.

The manner of preparing the fallow ground:—It ought at leaſt to be broke up before the firſt of June, and not turned over altogether flat, but ſo as to let the air and wind have an eaſy acceſs in between each furrow, otherwiſe you will loſe much of the manure that is floating then, on account of the ſmoothneſs of your fallow, the compacted ſtate the ſod is in, and the want of cavities to contain them. About a week or

ten days before you deſign to commence croſs-ploughing, take a heavy three horſe harrow, and give the fallow a good harrowing; it will ſubdue ſuch of the ſward that may remain green and cloſe the cavities, and looſen the ground. The croſs-ploughing ought to be compleated by the 10th of July, otherwiſe the beſt of the ſeaſon will be loſt; for it is well known, that the greateſt ſeaſon for exhalation is drawing on, and of conſequence the dews will be ſtrongly impregnated with alkaline ſalts, or with ſome other ſtrong, powerful body of ſubtile matter: For inſtance, if you have a ſore upon any part of your body or limbs, take and wet it with the dew that falls then, and it will ſmart; if wetted with ſpring water, it will not have the ſame effect. After the croſs-ploughing, or any of the other ſucceeding ploughings that you deſign to give it, ſtrict attention ought to be paid to the falling of rains, that will beat the top of the ground; or, when your ground has laid a week, or ten days, there will be a thin cruſt formed on the top of it: Whenever that is the caſe, commence harrowing of it; for one good three horſe team will then be able to harrow ten acres per day, otherwiſe that cruſt will be detrimental to the reception of thoſe ſubtle fluids, which have been mentioned, that compoſe vegetables. Repeat the operation according to the ſtate the ground is in; if poor, it will require more; but on an average, five ploughings and harrowings at proper diſtances of time, from each other, will

put the pooreſt ground in a ſtate that will produce from ſixteen to twenty-two buſhels per acre. I find that this method of manuring anſwers beſt on loam mixed with ſand or gravel, and has but little effect on clay; one reaſon which may be aſſigned, why it has not the ſame effect upon the latter is, that the parts that it is compoſed of, coheres cloſer and ſtronger together than that of any other ground.——The above experiments have only been tried with the wheat that is called, in the counties of Ulſter and Orange, by the name of Thorne's wheat: it is a little white-bearded, brought from Long Iſland, and on ground clear of ſtone. Query, whether this method of manuring, by frequent ploughing, would not have a good effect upon land that is too rich for wheat, by affording a greater degree of exhalation? I had a ſmall field of about five acres, of a ſandy loam, the laſt crop poor rye; on one end had ſtood a log-houſe, about four years; the method of ploughing and harrowing, as before mentioned, was obſerved on the whole; one and a quarter of an acre of the ground, neareſt and about where the houſe ſtood, was very rich.——October 1ſt, 1787, I ſowed a ſmall quantity, leſs than one buſhel of wheat: my return was fifty three buſhels and thirteen quarts. Some part of this ground, before ploughing, appeared poor; the reſt of the field was ſowed with rye; it grew, and was very rank. It is three years ſince I have entirely omitted ſowing rye; for I find a greater number of buſhels of wheat can be raiſed off the ſame piece of ground.

I found it a difficult matter, in a ſtiff ſward, to ſubdue the blue graſs in one ſummer ſeaſon, even with four or five ploughings, until adoping the method of breaking up the fallow ſhallow, not exceeding five inches; thereby the roots are expoſed to the ſun and drought, and of conſequence muſt periſh much ſooner than if ploughed deep. The ſecond ploughing, *turn the yellow ground up*, or nearly as deep as you would wiſh; but obſerve to make the laſt rather the deepeſt in the whole ſeaſon; by that means the beſt, warmeſt and ſweetened ground will be at the bottom. The froſt ſoon ſetting in after the ſeed is committed, prevents the ſubterraneous heats before-mentioned from diſturbing or emitting of the volatile ſalts, until the ſpring; the ſprout that grain or vegetables are compoſed of having an attracting and abſorbing quality for all matter of its kind, and thereby has a longer time and opportunity to attract and abſorb thoſe particles; for the ſource or ſtrength lying at the bottom, and covered with uncharged ground, muſt take a longer time to make its way to the ſurface of the earth; neither will the loſs of exhalation be as great.

Though this mode of proceeding is different from the common practice, yet I am convinced, from a three years practice (let the cauſe ariſe from whatever quarter) that it is preferable to the antient mode of making the laſt ploughing the ſhalloweſt, or any other that I have practiſed, both to ſubdue the ſward, and of leaving the ground in a better prepared ſtate for the reception of ſeed. One of my neighbours,

about four years ſince, ſhewed me a ſmall drain that he had cut from a place where water would ſtand in the ſpring, and injure his wheat; the black ground taken out was ſcattered; the yellow laid along the ſide of the drain: I ſaw the wheat at two different times, and that that grew on the yellow ground had, in the beginning of June and July, when I ſaw it, a much better colour, ſtood thicker, and was longer than the reſt of the wheat ſtanding beſide it; and laſt ſummer I ſaw an inſtance of a ſimilar kind: to account for the cauſe, I could not, upon any other juſt principles than thoſe already offered.

This method of preparing the ground will undoubtedly require four ploughings, and will likewiſe anſwer a good purpoſe with thoſe whoſe team is too weak to break up as deep as might be neceſſary, and the laſt ploughing not more than one inch deeper than any of the preceding ones. The ſeed in this caſe muſt undoubtedly be harrowed in, and not until four or five days after the ploughing, which method I would recommend in all caſes, where the ſoil was a ſandy loam, or ſandy.

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EXPERIMENTS ON MARL.

September 1791, took out of the ſoil about ſixty waggon loads of white ſhell marl, (one-fourth black dirt) and ſtrewed it over two acres of fallow land, that had been ploughed three times that ſeaſon: The firſt of October, ploughed the

marl under; and four or five days after, committed the ſeed, much damaged by the winter—Return of the two acres, about forty-four buſhels. As ſoon as convenient, turned the ſtubble down, and after two other ploughings ſowed the ſeed the firſt of October, 1792, damaged again by the winter, but much more by a long cold drought, which took place the latter end of April and the beginning of May, the return only about thirty two buſhels. During the whole of laſt fall, the place where the heaps of marl had laid was obſervable, from the rankneſs of the bed of white clover that was on the ſame: Winter 1792, rode out about ſix hundred ſled loads of marl (about one ſixth black dirt); on five acres put about two hundred loads, and in the ſpring ſtrewed it over the ground; then broke it up; two weeks after gave it two good harrowings, and then croſs-ploughed it, much deeper than the firſt time. About the 12th of May, ſowed two acres with flax-ſeed, the reſt with oats: Flax and oats very fine; turned the ſtubble down as ſoon as was convenient; after two other ploughings and harrowings, ſowed it with wheat about the latter end of September: The return, on an average, about twenty-four buſhels per acre.

In the ſpring of 1792, planted about ten acres of ground with corn; four of them was manured with marl, four with barn manure, and two with about an equal quantity of each; all ſtrewed over the ground, previous to the firſt ploughing: thirty rows that went acroſs each piece, was again manured

on the hills with aſhes. The corn that was manured with aſhes, and that with marl, took the ſtart immediately in colour and bigneſs, and continued the ſame, until the ſetting of the ears: A drought ſetting in, made the leaves of the corn twiſt and wither up very much; that which had the marl on it, began to curl a week ſooner than any of the reſt: that that had both kinds of manure and the aſhes on it, were next. The ground which had the manure from the barn, was ſcarcely affected with the drought, and the ears were larger than any of the reſt. I think I put too much marl on the ground. After the corn was collected, the ſtalks were pulled out of the ground by the roots, and flung in large heaps to rot; then harrowed the ground well, and ploughed the ſame about eight inches deep; about one deeper than it had ever been before. The 15th of October, ſowed the ground with wheat—damaged in the ſpring with the drought before hinted at in April and May, retaining a dark blue colour, eſpecially the wheat on the marled ground much better than any of the reſt; about ſixteen buſhels per acre return. The remaining part of the ground marled was about four acres; broke it up in the beginning of June 1792; ploughed it four times in the courſe of the ſeaſon, committed the ſeed about the 26th of September (the blue graſs not properly ſubdued) the whole of it would have laid down, had it not been for the drought in May laſt mentioned, which kept it near two weeks from growing ſcarcely any, ſo that about only the one-fourth

leaned a little—Return not leſs on an average than thirty-five buſhels per acre. The whole of the ground on which the aforeſaid experiments were made, was level land, clear of ſtone and ſoil, a loam mixed with ſand, except about one acre of the laſt mentioned piece, of which the one-half was a clay ſoil, mixed with ſmall round ſtones: the other part a gravelly knoll. The whole of my calculations in buſhels of wheat, were made from the number of ſheaves that they contained, and what they would produce, except the fifty-three buſhels and thirteen quarts mentioned.

April 1793, broke up about nine acres of ground for corn, of a ſandy loam: five of them had about forty-five loads per acre ſtrewed over the ground of barn manure. About the 20th of May croſs-ploughed the whole. The 28th, planted it with corn—put about one pint of marl (that had been expoſed to the froſt two winters.) On each hill over that part of the ground which had not been manured, except over one acre of the manured—I put ſomething leſs on each hill; the whole of the corn very fine. That acre prepared with the barn manure and marl, was equal to any that I ever ſaw grow in that part of the country. From the experiments and obſervations made, I perceive that the ſhell marl acts upon vegetables ſomething like aſhes; and that about the ſame quantity will anſwer the purpoſe for corn. It ought to be thrown up and expoſed to the froſt at leaſt one winter ſeaſon, then it will pulverize, and have the ſame appearance as aſhes.

It is friendly to every kind of grain that I have tried, and likewiſe to white clover. I ſhall be able againſt the cloſe of another ſeaſon, to aſcertain the effects it will have upon meadow land; and am at preſent of the opinion that it will anſwer clay land better than any other manure.

The white ſhell marl has been diſcovered, and likely may be found in all ſunken holes that are fed by living ſprings, and the ſurrounding aſcending ground a ſandy or a loam. Its colour when wet, appear at a diſtance like ſtrong lime mortar; when dry, much whiter. A number of ſmall ſhells are diſperſed through the whole; ſome reſembling the ſhells of ſnails, and others like that of muſsels; ſome as big as a ſixpenny-piece. The manner of trying it, is by putting a ſmall lump into a glaſs, and pouring it full of vinegar; if it is good, it will immediately froth and ferment, and make the glaſs run over, and continue in an agitated ſtate for three or four minutes. Something like unſlacked lime on the top of this white marl: Sometimes there is found to be (which is the caſe with mine) about one foot of manure that reſembles blue clay, as eaſy for the ſpade to enter as the other kind, from the apparent greaſineſs reſembling hard ſoap when it is firſt made, but ſomething ſofter: in this no ſhells will be found. My reaſon for mentioning this circumſtance attending it, is, that many have taken it to be blue clay, and therefore have given up any further ſearch. Clay will generally have ſand or gravel with it, which is not the caſe with marl, except

upon the edges, where they may waſh in among it. The depth that it lays from the ſurface of the ground are various, from half a foot to five or ſix feet.

The grey marl has been diſcovered by a number of my neighbours. Its quality is not as ſtrong as the white or ſhell. From the obſervations that I have made, it may be found in ſuch ſunken holes as are not continually fed with living ſprings, and the ſurrounding ground generally a clay: When that is not the caſe, there is ſcarcely ever any manure in ſuch places but black dirt.

While I am on the ſubject of manures, I ſhall juſt obſerve, that I conceive that farmers in general loſe a great quantity of their barn manure, by not having gutters to the eve of their barns, to keep the drop off the roof from falling into their yards, and by not keeping their manure covered or ſheltered from the ſnow, rain, and ſun. It is my opinion, four loads ſheltered from the weather, will be equal in ſtrength to five that has been expoſed. The evacuations that falls from the cattle, will afford moiſture ſufficient to bring on a fermentation to rot the ſtraw or litter that are generally uſed on the like occaſions.

JOHANNIS MILLER.

ALBANY, FEB. 18, 1794.

ON

# WHITE MULBERRY HEDGES:

*BY PETER DELABIGARRE, Eſq.*

THE urgent neceſſity of planting hedges, as the only cheapeſt ſubſtitute to our fences, which are growing dearer and more ſcarce every year, being felt and acknowledged, it remains to aſcertain the beſt kind of plants for hedges.

Upon this ſubject nothing can lead us to a good choice, but practice and example: therefore we muſt conſult Europe, where there is a great variety of what they call live fences. We there remark a great defect which was brought on by chance, or by the careleſsneſs of the firſt planters: that is, the hedges are made of different kinds of wood, and ſuch (it is proved by experience), never anſwer half ſo well as thoſe of one and the ſame kind of wood. Therefore in the firſt inſtance, it will be eaſy to avoid that defect in our future plantations.

White and hawthorn, red elm and birch tree, are reckoned the beſt plants, and are more generally uſed for hedges; The latter is recommended by its flexibility, to be interwoven

from the foot to the top, ſo as to become impaſſable. Either of thoſe plants will make a better hedge when planted in two rows eighteen inches diſtant from each other.

Twelve years ago, an induſtrious gentleman of the Agricultural Society of Lyons, made a trial which deſerves our utmoſt attention: He planted hedges of mulberry, which beſides the above-mentioned advantages, produce a greater one, being *the food for the ſilk worm.*

As it would be beyond the limits of my ſubject, to enter on any particulars about the raiſing of ſilk I ſhall; attempt in another communication to lay before the Society an eaſy and clear method upon that rich branch of Agriculture: It is ſufficient at preſent to ſhew the connection of it with our *mulberry hedges*, as a ſtrong inducement to give the preference to that kind of hedges.

I ſhall aſk leave only to relate a curious inſtance of the utility of thoſe hedges.

The 20th of April, 1784, after the ſilk worms were out of their firſt mewing, about twelve hundred of them were ſpread upon a mulberry hedge. They remained expoſed to the intemperance of the ſeaſon; which, having been very cold, left little hopes of their ſucceeding: We took care to viſit them every day, and particularly during the violent rains and the moſt boiſterous weather: they were never ſeen very

ſenſible to the cold, nor exerting themſelves for ſhelter: On the contrary, they remained motionleſs, and bore well the ſtorm: In ſhort, neither the cold nor the heat appeared to make much impreſſion upon them. They were free from the diſorders commonly attending thoſe tended with the greateſt trouble and care in our houſes.

Notwithſtanding the bad ſeaſon, which we might ſuppoſe would have killed them all, out of thoſe 1200, we gathered 450 cocoons, which proved to be the fineſt ſilk ever raiſed in France: theſe cocoons gave two pounds ſeven ounces of raw ſilk. Then the reſult is the loſs of about two-thirds, which will appear very inconſiderable to thoſe who know by experience that a greater proportion is loſt in the common way of breeding at home, where the fifth part only ſucceeds.

To return to the manner of planting mulberry hedges: Round the field to be incloſed, dig up a ditch three feet wide and two feet deep: the longeſt roots of the young plants being cut off near the hairy fibres, muſt be planted about eighteen inches deep, at the diſtance of three or four inches from each other: After the ditch is filled up, every ſhoot muſt be cut at the height of two or three inches above the ground. Whether the plant is big or not, there is no matter, provided it is at leaſt one year old. Obſerve only to give the preference to the white mulberry, as the beſt for the food of the ſilk worms.

The time to plant theſe hedges is in the beginning of April. The ſecond year it is neceſſary to cut again the ſhoots about ſix inches above the ground, in order to give more ſtrength to the ſprouting branches, which will form a pretty ſtrong hedge the third year; and at laſt grow ſo thick as to be impaſſable by any cattle. It may be twiſted and interwoven a great deal eaſier than the hawthorn. If you chuſe to make a ſtronger hedge, you may plant it in double rows, as it is uſed by people who do not mind that little expence.

It is well underſtood, that for three years the young hedge muſt be defended againſt the cattle by a proper fence like every other plantation of the kind, and the ground muſt be worked and kept clear from weeds.

No wood grows quicker than the mulberry; and, what is more intereſting to this country, no kind of inſect whatſoever, not even the locuſt touches the limbs nor the leaves of the mulberry: It ſeems reſpected by all deſtroying inſects, and reſerved only for the ſilk worm.

I forgot to mention, that in caſe the breeding of the ſilk worms could not ſucceed in open air, and left entirely to the chance of the weather upon the hedges; yet it is obvious that the gathering of the leaves for the breeding at home, will be always eaſier from thoſe hedges than from high mulberry trees.

You may remark, that after the firſt leaves of mulberry have been employed in the ſpring to feed the ſilk worms, the other leaves of the fall may be gathered; and when dry, they afford in the winter a good food to the cattle—above all to the cows who give milk.

The objection will be, the difficulty of getting thoſe young mulberry plants in this country to make hedges with. They will coſt ſomething; but they may be got from ſeveral nurſeries in New-Jerſey, and Long Iſland. However, any farmer not wiſhing to go to that expence, may eaſily raiſe thoſe plants from ſeeds, in the following way:

Gather all the ripe berries fallen down under the white mulberry tree: put them for two days in a dry place, where they muſt be turned up and down, for fear they ſhould be heated: After which, you muſt waſh them with your hands in a tub, pouring over ſome water from time to time, in order to ſeparate the ſeed from the muſt. Let then the water ſettle for a quarter of an hour; and all the uſeleſs particles floating over, will be taken out. You muſt repeat the above waſhing, till the ſeed is well diſengaged and pure. The beſt ſeed being the heavieſt, will ſtay always at the bottom of the tub.

This being done, ſpread all the good ſeed to dry upon a bit of linen: when dry, keep it in a cloſet till the ſeaſon

fit for ſowing. Obſerve that that kind of ſeed never keeps good longer than one year.

The moſt proper time to ſow the mulberry, is in the beginning of April. Some people pretend that the ſeed ſucceeds well when ſown in the very trench made for the hedges. But a long experience teaches that it is better to raiſe the plants in a nurſery where the ground is rich and well manured. You will chuſe for that purpoſe a place ſheltered from the north and cold winds. This place muſt be digged and prepared before the winter. The beſt way is to make a bed four feet wide only, in order to be able to water it, and pick the weeds out, without trampling upon the ſeed bed. Before you water the ſeeds, you muſt ſpread over ſome light ſtraw to prevent the ground from becoming too hard, which otherwiſe would be an obſtacle to the riſing up of the young plants.

The plants are fit to be tranſplanted the following year in the trenches intended for hedges, according to the manner and at the time above-mentioned.

The mulberry grows in every ſoil, but it delights in a rich ſandy ground.

ON

## CAST-IRON PLOUGH-SHARES:

### *BY COL. JOHN SMITH.*

DURING the laſt ſpring and ſummer, in ploughing my fields, I made uſe of the caſt plough-ſhare, which was exhibited to the Agricultural Society, at their meeting during the laſt ſeſſion of the Legiſlature, and found it to exceed my moſt ſanguine expectations. It is caſt in the form of a Dutch ſhare, after the beſt model that could be procured by the Society, with this exception, that the edge is not complete, and not ſo wide by about three inches, as it will be when finiſhed with the falſe edge, which is made of wrought iron or ſteel, and faſtened on with rivets. The ſoil in which I uſed this ſhare, was light and free from ſtone, tho' I believe, with careful uſage, it will anſwer in any other ſoil, altho the ſame may be ſtony and incumbered with ſtumps. This plough-ſhare beſides anſwering every purpoſe of thoſe made of wrought iron, will laſt to plough as much as two of the latter, before it is worn out, the caſt iron being nearly as durable as ſteel before it is hardened. By this experiment, it is very obvious, that the caſt plough-ſhare will be very beneficial to farmers, and ought to be encouraged by this Society. They may be had of Mr. Peter T. Curtenius, in New-York, either with or without the edge, which is made of wrought iron or ſteel.

# OBSERVATIONS

ON

# CONSTRUCTING A GREEN-HOUSE:

*BY JOHN W. WATKINS, Esq.*

THE building ſhould be ſunk in the earth from two to four feet, in proportion to the ſize of the houſe, and according to the nature of the ſoil; as clay retains moiſture, and of conſequence produces damps, in ſuch ground it ſhould not be ſo deep. The height ſhould not exceed twelve feet from the exterior ground, by which it will be leſs expoſed to high winds. The width ſhould not exceed ſixteen or eighteen feet, as the ſun's rays are at that diſtance from the glaſs very feeble. A ſouth front is well known to be the true one, but advantage ſhould be taken of glaſſing as much of the eaſtern end as poſſible, for the benefit of the morning ſun. The front ſhould decline northward from a perpendicular with the horizon, ſo as the angle made thereby with the horizon, will at noon day in winter, bring the rays of the ſun to ſtrike the glaſs at right angles, and the roof ſhould deſcend the oppoſite ſide without a break. By this poſition of the roof and glaſs, the rays of the ſun are thrown upon every part of the inſide of the houſe, and the whole becomes heated thereby;

more of the rays are alſo introduced into the building, and when the ſun produces moſt heat during the day, there is no reflection of its rays, and at other parts of the day, the reflecting angle being obtuſe, does not powerfully caſt off the rays. The inſide of the rafters of the roof, ſhould be lined with boards, and the ſpace between that and the roof filled with a mixture of ſtraw, ſand and clay made into mortar; boards ſhould be uſed in preference to ſhingles, as making fewer breaks in the roof, leſs opportunity is given for the admiſſion of cold air. The reſidue of the building may be of ſtone or brick work, or a frame building filled in with bricks, and no flooring of any kind upon the ground. Shutters on the outſide are ſufficient, and it is preferable to have them hung on hinges, as the leaſt troubleſome, to the common practice of ſliding ones; they ſhould be made to fold into the ſpaces between the windows.

Before putting the plants into the houſe, the bottom ſhould be covered with bark from a tan-vat, about a foot deep, according to the depth the building is ſunk in the earth.

The advantages propoſed by this method of conſtructing are, the leſſening the expence of building, that the heat of the ſun being ſufficient to warm the houſe, the trouble and expence of warming it by a ſtove is avoided, which unleſs very carefully attended, the plants may be injured by too much heat, and are always by the ſmoak that unavoidably

makes its way out of the pipes. It would be proper nevertheleſs, to make arrangements in conſtructing the houſe for uſing a ſtove, in caſe a long ſucceſſion of cold cloudy days by obſcuring the ſun, ſhould reduce the heat in the houſe, below that degree of temperature neceſſary for preſerving the plants, which is a caſe that will ſeldom happen, as one clear day will warm the houſe ſufficiently to admit its being ſhut up for ſeveral days.

Plants in a houſe of this kind require leſs water, and do not ſuffer for the want of atmoſpheric air. It is probable, as the earth is charged with electric fluids, and as vegetable ſubſtances are known conductors of it, that the bark by its fermentation, not only generates heat, but ſerves as a mean to produce out of the earth, an atmoſphere for the plants, ſufficient with ſuch atmoſpheric air as will find admiſſion, to ſupply the quantity exhauſted by the daily rarefaction occaſioned by the ſun's heat.

A green houſe has been uſed upon this conſtruction in this State, without having had the leaſt occaſion of being heated by fire. The plants in the ſpring were remarkably thrifty; tropical fruit ripened in it during the winter, and young fruit formed on the trees. It required no other care, than now and then watering the plants, and ſhutting the windows as ſoon as the ſun left them.

A TREATISE ON

# SILK WORMS:

IN TWO PARTS.

THE FIRST ON THEIR MANAGEMENT WITHIN DOORS, AND THE SECOND CONCERNING THEIR TREATMENT IN OPEN AIR UPON HEDGES.

*BY PETER DELABIGARRE, Esq.*

## FIRST QUERY.

WHENCE ſhould you get the eggs commonly called *ſeeds of ſilk worms?* What kind will ſucceed, and are beſt calculated for this country?

(Ans.) Many people are of opinion, that preference ought to be given to eggs of a warmer climate than that intended for the raiſing of ſilk worms: but we are inclined to believe, that ſuch preference is rather due to thoſe eggs raiſed in a climate of the ſame temperature, as it is obvious, that the change of air and food muſt have a great influence upon the worm, at leaſt for the firſt year. However the moſt important thing is, the choice of the eggs, whether procured from abroad or raiſed at home.

(2d Que.) What is the mark of good eggs, and how are you to diſtinguiſh them from the bad ones?

(Ans.) A good egg impregnated by the male, takes ſucceſſively the colour of gridelin, of purple, and at laſt of an aſhy hue: it muſt crack under your nail with a ſlimy and thick matter, whilſt the bad one makes no noiſe when bruiſed, and it is a kind of fluid and *dilated* ſubſtance.

(3d Que.) How are you to preſerve the eggs, and how prevent them from being hatched before the leaves of the Mulberry are put forth?

(Ans.) You muſt keep the eggs in a dry place, free from froſt in winter, as well as from heat in ſpring and ſummer.

The beſt method is, to leave the eggs on the ſtuff which they were laid upon by the female: you need not take them off ſooner than two or three days before the time of hatching.

(4th Que.) Are the eggs which come out of white cocoons, preferable to thoſe afforded by yellow ones?

(Ans.) The eggs of white cocoons, produce worms much inferior to thoſe of yellow cocoons. The reaſon is this:—the white cocoons gives leſs ſilk; hence it is very right to preſume, that the worms which made the greateſt quantity of ſilk, were the ſtrongeſt and the moſt free from any diſorder; on the other hand, it has been found by experiment many times, that from 300 to 320 white cocoons give only one pound weight of ſilk, whilſt from 230 to 240 yellow cocoons produce an equal quantity; the ſame difference in the quality, was proved in the ſpinning of both.

(5th Que.) What time is moſt proper to hatch the eggs?

(Ans.) As it is impoſſible to determine any particular day, it muſt be calculated from the temperature of each climate and the knowledge of the ſeaſon, relative to the putting forth of mulberry leaves, in ſuch way as to be certain of getting ſufficient food for the young worms.

Notwitſtanding, the ſooner the better: becauſe the young worms want the tendereſt leaves; thus the moſt proper time to begin the hatching is, when you perceive the firſt buds of Mulberry diſpoſed to come out.

(6th Que.) What is the beſt method of hatching?

(Ans.) The choice of the eggs and the method of their hatching, are the two important objects upon which depend chiefly all our future ſucceſſes, and in the mean while, it is worth the while to obſerve, that both are entirely at our own diſpoſal. As ſoon as the buds of mulberry are coming out, we muſt take particular care to have our eggs hatched. The eggs muſt be properly divided into ounces, in ſuch a way, that one ounce ſhould be hatched all at once if poſſible, in order to avoid the trouble and labour of feeding ſeparately the worms hatched at different times.

The eggs are commonly put in a ſmall bag, to the quantity of an ounce. If you intend to raiſe a great quantity, at the interval of a day, you put as many bags as you wiſh to hatch

at the foot of your bed, under the mattraſs or feather bed, then you move them nearer and nearer by degrees to the middle of the bed. The bags muſt be opened every day, to admit freſh air to the eggs, and facilitate their perſpiration.

When they turn whitiſh, it is a ſign that the worms will come out very ſoon: then a greater attention is neceſſary to the eggs; beſides the cuſtomary airing, they ought to be moved and ſtirred up five or ſix times in the courſe of twelve hours, for fear that the embryo ſhould be choaked by a too cloſe heat. Any inconvenience of that kind, may be better avoided by putting the eggs in ſmall boxes of pine boards, about an inch deep, paſted inſide with white paper, the bottom of which is filled with cotton of about 6 lines deep and covered with a bit of white linen, upon which the eggs are ſpread.

Though the eggs hatched in that way are not liable to be heated ſo ſoon as in the bags, the boxes notwithſtanding ought to be opened once a day, and oftener according to their age or time of hatching.

In Italy, Spain and ſome part of France, it is the buſineſs of women to hatch the eggs of ſilk worms, by wearing the above mentioned bags under their petti-coats, and when they go to bed, they put them under their pillow for the night. Each of theſe ways is good, provided care is taken to air them as recommended before. The mean degree of heat moſt

ſuitable to the hatching, is 42° of Reaumur's, or 96° of Farenheits thermometer, which is reckoned the common heat of the human blood.

(7th QUE.) Is it not poſſible to hatch theſe eggs by artificial fire, in ovens, ſtoves, or hot rooms?

(ANS.) That way is practiſed and recommended by people *raiſing* ſilk worms upon a very extenſive ſcale, but we find that it would require too much expence, to render it practicable to the greater part of our country folks. Theſe coſtly experiments agree very well with ſome curious and rich people, who can afford to build ovens and ſtoves, &c. The moſt eaſy and leaſt expenſive way, ought to fix all our attention at preſent.

Merely to ſatisfy the curioſity of ſome of our readers, we beg leave to give here a ſhort deſcription of a new contrivance for the purpoſe of hatching.

"Under the roof of a houſe, chuſe a room of about 10 feet ſquare, and 8 or 9 feet high; fix a ſtove in the middle, the funnel of which muſt carry the ſmoak out through the roof; make two ſmall openings in the roof, 3 feet diſtant from the funnel on each ſide; fix on both openings an iron pipe, open around like a grate; it may be made of iron wire ſo as to give an eaſy acceſs to the air. In the mean while, to prevent the coming in of birds, rats, or any vermin, you

muſt cover the top of the pipes with a kind of iron plate made like an elbow, as you might have ſeen many caps fixed on chimneys, turning very much like a weather-cock.

The room being diſpoſed in that way, it remains to build up upon four or ſix poſts, a kind of floor made with narrow boards half an inch diſtant from each other: that floor muſt be about four feet high, and fixed horizontally upon the poſts: on the floor yon lay as many ſieves made of clear ſilk ſtuff, or of ſome gauze as you have occaſion and room for; in theſe ſieves you ſpread at the thickneſs of two or three lines only, and as equally as poſſible the eggs to be hatched. Then you muſt regulate the temperature of the room by a thermometer, according to the degree already mentioned. In order to keep an uniform degree of heat, you will have a kind of turning ſocket inſide of the funnel of your ſtove, with which you may open or ſhut up that funnel as you think proper.

The eggs being well ſpread in the ſieves, never run the riſk of being choaked by their natural perſpiration, and there is no need to ſtir or turn them over from time to time, as in the common way of the bags, the heat penetrating as well under as above the ſieves: if you want to give freſh air to the room, you may open the door or a window for a few minutes. This new method of hatching is leſs expenſive than many other contrivances we have ſeen before: provided you can go to the

expence of ſuch room, you may hatch as many eggs as you chuſe, without trouble and inconvenience."

(8th QUE.) How many days are required for hatching before the worms come out?

(ANS.) The hatching will be quicker or ſlower according to the heat or cold to which the eggs have been expoſed in winter, and according to the temperature of the months of February, March, and April. But, ſuppoſing the eggs were kept all winter in a proper place, as mentioned before, the worms will come out from 9 to 12 days after the beginning of the hatching. *

If this common time of hatching is ſhortened by a haſty fire or ſudden heat, a great number of the worms will periſh in the courſe of the raiſing.

(9th QUE.) After the time above mentioned for the coming out of the worms, how do you know that the remaining eggs will not hatch at all?

(ANS.) Whatſoever care, whatever attention is paid to the eggs, it is almoſt impoſſible that in an ounce of ſeed which

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* Since this article was written, we are informed that the hatching does not exceed 8 or 9 days in this country: this is another proof that this climate is the more friendly and ſuitable to the ſilk worm. Beſides it confirms our other obſervations on the quicker growth in the vegetable, as well in the animal ſpecies of America.

contains about 42,000 eggs, there ſhould not be ſome without ſperm or unfit by reaſon of ſome defect; therefore, after two days it is needleſs to wait for other worms, and the remaining eggs muſt be thrown away; they would produce but very indifferent and weak worms.

In conſequence of that ordinary and unavoidable waſte of eggs, we would adviſe to add half an ounce more to every four ounces in the hatching, and ſo on in proportion, to compenſate that loſs.

(10th QUE.) Is it not proper to give ſome previous preparation to the eggs, in order to facilitate their hatching?

(ANS.) Experience the beſt of all maſters, teaches us that they are excluded in a ſtate of the beſt preparation, and that therefore we ought not to meddle or tamper with them. We ſhall obſerve only, that bathing them in wine, or any other liquors, as practiſed by ſome people, is ſo far from accelerating or helping the eggs, that it has a directly oppoſite effect.

(11th QUE.) Is it neceſſary to take up the worms the firſt day that they are come out?

(ANS.) By all means, becauſe were they to remain longer among unhatched eggs, they would communicate to them a noxious heat, and would contract themſelves ſome diſorder and die before the term of their natural growth.

(12th QUE.) Is it neceſſary to feed the worms as ſoon as they come out of the eggs, and how?

(ANS.) If the eggs have been hatched in ſmall bags, when on looking into the bag you perceive ſome of the worms coming out, it is time to ſpread all the eggs in a box, the bottom of which muſt be covered with a thin bed of cotton, overſpread with a piece of old white linen; then as ſoon as there is a ſufficient number of young worms come out, you put over them a piece of parchment as wide as the box; that parchment muſt be pierced with holes all over like a ſieve; you lay over it ſome tender leaves of mulberry; you will obſerve to put two ſtrings to each ſide of the parchment, in order to take out the new worms upon their leaves and to ſtir up the remaining eggs with the end of a quill, as well as to give freſh air to the box.

Some people uſe a piece of paper inſtead of parchment, but it is obvious that this laſt is a great deal preferable to the other; the paper attracting all the moiſture of the leaves, ſoon ſticks to the eggs, and makes them ſo cold as to prevent many worms from coming out.

If the hatching has been done on ſieves in the ſtove-room, you have nothing to do but to put the parchment over the eggs in the ſame way.

As ſoon as you perceive a ſufficient number of worms upon the leaves, by lifting up the parchment you carry thoſe leaves

with the worms into a larger box or ſhelf, paſted inſide and at the bottom with white paper; you muſt obſerve not to fill up but about a third part of the bottom with your leaves; * there you feed the young worms till after their firſt moulting.

After that firſt crop, you put the ſame parchment again upon the remaining eggs with ſome other leaves over, and repeat the operation till the whole hatching is come out; it is underſtood in the courſe of two days and no longer.

You will obſerve not to mix the worms collected the firſt day, with thoſe come out the ſecond; thus by keeping apart the worms of the ſame age, you will avoid an irkſome trouble at the time of their getting upon the boughs to ſpin their ſilk.

(13th Que.) What degree of heat is neceſſary to the worms after their coming out? which is the moſt proper leaf for them?

(Ans.) Provident nature takes care to cloath the ſilk worms for the firſt days of their life, with a kind of furred hairs, which go off before the third moulting; that evinces enough the want of warmth; thus we think it neceſſary to keep the worms in the ſame degree of heat for 10 or 12 days after their coming out.

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* Becauſe the worms growing bigger every day, could not find room enough if they were crowded into the box at firſt.

As to the age and the quality of the leaves fit to be given to the young worms, many writers entertain different opinions: but on that ſubject we muſt ſtick to nature, and adviſe you to give the tendereſt poſſible, whether thoſe of grafted or ungrafted, young or old trees. You may depend only on this experienced fact, that the ſilk worms cannot live upon any other ſort of leaf but that of mulberry: though they may eat by way of paſtime ſome other leaves, like thoſe of lettice, roſe-oak, or elm, they could live as long without any food at all, and if they are deprived for ſeveral days of mulberry leaves, they muſt die.

(14th QUE.) How many times a day ought the worms to be fed in the beginning?

(ANS.) The moſt general cuſtom is, to feed the worms twice a day till they get in their firſt moulting, but we have found it better to feed them three times, obſerving not to give but few leaves at once, and take care that the firſt leaves ſhould be eaten before you give the other. By that way, you keep the worms in a more uniform ſtate of heat and cleanneſs, as by the change of leaves no unwholeſome dampneſs, nor any noxious vapours have time to riſe from their food.

How many days they continue to eat from the moment they come out to that of the firſt moulting, is not to be determined preciſely: it depends in a great meaſure on the degree of heat, and the quality of the leaves; for

example : — If the weather is mild and favourable; if the worms are kept in the ſame degree of heat in which they came out; if the leaves are tender, dry and free from froſt and burning winds, then the worms will arrive in ſix or ſeven days to their firſt moulting.

On the contrary, they will take more time in proportion to the circumſtances here pointed out, and when they do not arrive to that moulting in leſs than a fortnight, there is little hope of their doing well for the future: we have remarked in that caſe that they afford but an indifferent profit.

We have ſeen many people going to the trouble of mincing the leaves in order (as they ſuppoſe) to make the worms eat the heartier, we found however it was to no purpoſe, and we mention it only to deter our readers from ſuch uſeleſs trials which may be recommended or heard of.

(15th Que.) Before you proceed further, pray what is the nature of that moulting of ſilk worms? How many moultings do they undergo? Is there not a way to prevent worms from periſhing by that kind of diſorder?

(Ans.) The moulting of ſilk worms, is a torpid and ſleepy ſtate, which cannot be called properly a diſorder, becauſe it is natural to them, and ſeems neceſſary to digeſt by a preparatory action, all the glutinous particles deſtined for their future ſilk.

In that periodical revolution, worms want no food; they leave their old coat to get out with a new one. They undergo four moultings before they arrive to their ſpinning work: ſeveral die through theſe critical periods, but no remedy has been found yet, and we think it would be hurtful to attempt to accelerate even the courſe of that natural revolution. The only help is, to keep the worms a little warmer if poſſible, and particularly not to diſturb them.

(16th QUE.) How is the time of the moultings to be known? What care is required after?

(ANS.) A little before their moulting, the worms loſe their appetite; they look dull and weak; their ſkin becomes bright; they ſeek for a place to hide themſelves, under the leaves or in ſome corner of the ſhelf, always out of the way of other worms; there they remain motionleſs for about two days; their head becomes bigger and ſtands up; in the latter part of that time, their ſkin bends in wrinkles, and their body ſeems ſomewhat ſhortened. All theſe ſymptoms are better perceived in the three laſt moultings than in the firſt, according to the bigneſs of the worms.

It is not to be expected, that all the worms of one ſhelf will come to their moulting the ſame day; but if the greateſt part is come out in three or four days, which you may perceive by the colour of their ſkin as well as by their activity, then it is time to change their litter and clean the ſhelf,

In order to get the worms out, you muſt ſpread over ſome freſh leaves, upon which they will get ſoon, ſo as to enable you to lift them up from the ſhelf.

You muſt obſerve to proportion your ſhelves to the increaſe of the worms: for inſtance, after the firſt moulting, thoſe who were contained in one ſhelf, muſt be divided in two ſhelves of the ſame dimenſions, in order that they ſhould have ſufficient room. The ſame attention is neceſſary for their progreſſive growth at every other moulting.

(17th Que.) When the firſt moulting is over, how may we diſtinguiſh the worms that will do well, from thoſe that will not ſucceed, and are likely to periſh before they paſs through the other moultings? Out of the four moultings, which is the moſt dangerous?

(Ans.) As ſoon as the worms come out, you may remark three different kinds, ſome of a reddiſh, ſome of an aſh, and ſome of a black hue. The reddiſh colour is reckoned the worſt, that kind of worm will never do well, and we know from unqueſtionable experience, that it is better to throw them away: the two other kinds will ſucceed and ſpin the beſt ſilk.

As to the moſt dangerous moulting, it has been reckoned always, that a greater number of worms periſh in the third; no reaſon can be aſſigned for it; the fact lays open to our

obſervation, while the courſe of it remains hid, like a thouſand other ſecrets of nature.

(18th Que.) What time of the day do you chuſe to gather leaves for the feeding of your worms? How do you keep thoſe leaves?

(Ans.) Avoid carefully the picking of the leaves in the morning, until three or four hours after ſun-riſing, and only when they are free from dew or any dampneſs.

Before the firſt moulting, the worms require ſo little food, that it is eaſy to keep a few leaves in an earthen pot, covered with a bit of linen, and put in a dry cellar or in any other part of the houſe, out of the heat of the ſun.

According to the number and ſize of your worms, if you want a great quantity of leaves every day, they muſt be kept in large tubs or ſpread on the floor of a room, only open on the north ſide; then take care to ſtir or turn them over two or three times a day, according to the temperature, for fear they ſhould be heated or withered.

N. B. The number of meals after the firſt moulting, as well as the quantity of leaves to be given to your worms, muſt be regulated by their appetite: the beſt method is to feed them with few leaves at once, and to repeat it as many times, day and night, as they conſume the leaves of the former feeding.

If your worms are dull and without appetite, it is a certain

ſign that they are in want of heat ; then you muſt warm the room to the degree mentioned in our 6th query.

We obſerved that it was in vain to accumulate food for the worms as long as they were too cool, and deprived of appetite ; too many leaves in that caſe make them cooler than before, and at laſt kill a great number of them.

(19th Que.) What is the interval betwixt the firſt moulting and the ſecond, betwixt the third and the fourth ? Is it neceſſary to keep the worms warmer, in proportion as they grow bigger ? How often ought their ſhelves to be cleaned ?

(Ans.) 1ſt. Suppoſing worms in good order and thriving, they will get into their ſecond moulting, ſeven or eight days after the firſt, and ſo on for the two other following.

2d. The bigger worms grow, the leſs they ſtand in want of heat : however, as long as they eat heartily, it would be needleſs to *leſſen or to* alter ſuddenly the degree of heat which they have been uſed to from their coming out. The only thing which we would recommend after the third moulting, is to open a window for a few hours in the day time, in order to introduce freſh air into the room.

3d. Provided no diſorder, nor too long interval has taken place betwixt one moulting and the other, the ſhelves want to be cleaned only once after every moulting ; becauſe, you muſt carefully avoid diſturbing your worms. Notwithſtanding, if

one ſhelf is too much crowded you may take out as many worms as you think proper at the moment of a new meal, when they get on freſh leaves. Theſe inſects cannot bear to be touched, and it is common for them to die of the bruiſes received by the rude handling of perſons unaccuſtomed to them.

(20th Que.) Reſpecting the food of ſilk worms, is there a great difference betwixt the leaves of wild mulberries of this country, the red Engliſh mulberry, and thoſe Italian trees which are called white mulberries ?

(Ans.) We make no doubt that ſilk worms could eat leaves of wild mulberries, and thoſe called red Engliſh mulberries; but experience teaches us, that the moſt proper food is the leaf of the white mulberry tree. Yet there is a difference betwixt leaves of the ungrafted white mulberry and thoſe of the grafted one ; betwixt leaves of a young tree and thoſe of an old one: but for fear of being prolix in giving a full account of that difference, we ſhall only obſerve, that leaves of ungrafted and above all of young trees, are better adapted to the firſt age of ſilk worms, as far as their third moulting; after which, as they grow ſtronger, leaves of grafted or of old trees, being more ſubſtantial, will agree better with them for the remainder of their ſhort life.

They who may not have it in their power to chuſe the food of their worms according to the above inſtruction, ſhould

nevertheleſs be by no means diſcouraged, ſince they will find a ſufficient reward in feeding them even upon one ſort of leaf, till time ſhould have made ſuch improvements, as cannot be expected now that we are juſt beginning this branch of rural induſtry.

(21ſt Que.) You recommended in the 14th query, not to gather leaves but when dry; what then is to be done in rainy weather?

(Ans.) It is well known that wet leaves are very hurtful to the worms, and ſuppoſing that the rain ſhould laſt more than twenty four hours, (which is very ſeldom the caſe in the months of May and June) it would be neceſſary to dry leaves as well as poſſible upon ſome ſheets previouſly warmed for that purpoſe. As it requires a conſiderable time to dry the leaves, it is adviſable in caſe of a long and conſtant rain, to diminiſh the uſual quantity of food, till the firſt clear moment will allow the gathering of dry leaves again.

(22d Que.) Could not the ſilk worm feed upon leaves of ſome other tree?

(Ans.) We can ſay in poſitive terms, that tho' many curious trials and attempts have been made to this effect, nothing has been found to ſerve as a ſubſtitute for mulberry leaves.

A fact well known, is worth our attention reſpecting the leaves of mulberry; they are as much the peculiar food of the ſilk-worm, as thoſe of other plants and trees are unfit for him;

and we may aſſert with confidence, that the mulberry ſeems reſerved to the ſilk-worm alone, no other worm or caterpiller, whatever likeneſs they might have in their ſhape, habits, &c. to our ſilk-worms, ever feed upon mulberry leaves. Caterpillers may be ſeen by chance upon mulberries, but if you take the trouble to look attentively, you will perceive that they ſoon leave that place where they came by miſtake, or by a mere accidental wandering as they might have come upon a ſtone, &c.

(23d Que.) Is it neceſſary to keep the worms in darkneſs? Does a full light hurt them?

(Ans.) It has been obſerved long ago, that the ſilk-worm is inclined to avoid a bright light. Many naturaliſts conſider him as a nocturnal inſect. You may remark as a proof of it, that ſilk-worms are eager to conceal themſelves under leaves in the day time, and when there is any diſorder in a worm's houſe, you will find many more of them ſick in places moſt expoſed to the light than any where elſe. Therefore we adviſe to ſhut up the windows of the room in the day-time, or in caſe the weather ſhould be too hot, to hang up brown or green curtains, and let them open in the night.

(24th Que.) Is heat more noxious to ſilk worms than cold?

(Ans.) The difference is ſuch, that a great heat makes worms lazy, dejected, and without appetite. An exceſſive

heat happening at the time of their getting up to ſpin, is apt to choak the greateſt part of them. On the other hand, a cold, ſuch as happens in the month of May, ſometimes puts the worms a little back, but it never injures them ſo much as the heat above the degree before mentioned.

Then we may judge, that worms do better in dry weather, with a northerly wind, than in damp weather, with a ſoutherly wind, or during a dead calm. In this laſt ſituation, it is good to make ſome light fire in their room, in order to rarify the air, provided the room is well opened, and the fire ſhould not laſt longer than about half an hour.

(25th Que.) How long do the worms remain feeding upon the mulberry leaves, before they begin to ſpin?

(Ans.) Being over his laſt moulting, the worm eats voraciouſly, and wants a great deal more food than before. At the end of ſeven or eight days, he begins his cocoon; in that ſhort interval it is very neceſſary to clean the ſhelves every day, and procure as much pure air as the weather will permit.

(26th Que.) How may it be known that the worm is mature and ready to ſpin?

(Ans.) When you perceive him creeping upon the leaves without biting them, but keeping his head up and turning it in different directions, as if he was looking for a place fit to

faſten his cocoon on when he tries to get off the ſhelf; when his body is become tranſparent and bright, and like the colour of ſtraw; then it is high time to have ſome heath or other thin buſhes fixed beforehand upon tables.

(27th QUE.) Do you fix thoſe buſhes or boughs with their leaves on?

(ANS) Thoſe buſhes or boughs muſt be dry and well cleared of all their leaves. The beſt way is to fix them upon tables, in double rows, ſo as to make a kind of arched form betwixt the extremity of the twigs. At the foot of the boughs it will not be uſeleſs to put ſome thinner branches of birch tree or ſome clean ſhavings, in order to facilitate the getting up of the worm. Great care muſt be taken not to put too many worms on the ſame place.

(28th QUE.) Notwithſtanding all your care and ſkill, when worms are carried on the boughs, there may be ſome amongſt them who want ſtill to be fed for one or two days: in that caſe, what is to be done?

(ANS.) It is true that ſome of them want feeding yet, after they have been brought on the bough-table; then we muſt give them leaves on that table, and feed them ſo till they get up by themſelves on the boughs.

(29th QUE.) How can the worms be carried and placed upon the bough-table without hurting them?

(Ans.) From the ſymptoms given in our 27th query, when you know that your worms are mature, you preſent them your finger, to which they readily attach themſelves; but as it would be too long and tedious to carry them all one after the other, you depoſite as many as you can upon a varniſhed plate, to which they cannot ſtick faſt, and you carry them all at once upon a bough-table. It will be eaſy to diſtinguiſh thoſe who want to be fed yet; becauſe they lay on the table, and refuſe to get up on the bough.

(30th Que.) How many days does the ſilk worm employ in the ſpinning, and what is the time to pick up the cocoon?

(Ans.) The worm's ſpinning is completed in three or four days; but as among a great number, they do not ſpin all at the ſame time—the beſt method is to pick up the cocoons twelve days after the firſt worms have begun their ſpinning.

(31ſt Que.) Is it neceſſary to kill the worms in their cocoons? When and how?

(Ans.) If you cannot draw the ſilk ſoon after the picking up of cocoons, it is indiſpenſible to choak the chryſalis contained in each cocoon, otherwiſe that chryſalis would ſoon become a butterfly, and by boring its way through the cocoon, break the contexture of the ſilk. Therefore, after you have choſen and ſet apart the beſt cocoons intended for eggs or ſeed, as mentioned in the 4th query, you muſt take off the upper

part of your other cocoons, which is called the downy tow, and which is quite ſeparate from the ſilk; you put the cocoons in large baſkets, furniſhed on the inſide with a coarſe brown paper: when the oven is heated at the common degree for baking bread, you may put the baſkets into it, and leave them there for about two hours, till you hear no more the rattling noiſe of the inſects, as they move and ſtir about on account of the heat which they feel during that time.

Take care afterwards to wrap up thoſe cocoons in a blanket, in order to kill entirely thoſe who ſhould not have been choaked by the heat of the oven.

(32d Que.) How to manage the cocoons intended for eggs?

(Ans.) We forgot to mention before, that in the choice of cocoons, particular care muſt be taken to reſerve an equal number of males and females. The male cocoon is ſharp pointed, while the female is round at both ends. This choice made, the cocoons ought to be diveſted of that downy cover heretofore mentioned. Then you ſtring them together, males and females alternately upon a coarſe thread; but you muſt take care that the needle ſhould not go further than into the ſurface of the cocoon, in order not to hurt the chryſalides, nor to open any way to the air; hang this ſtring of cocoons in a dry and airy place till the butterfly comes out.

Upon a common average, one pound of cocoons will produce one ounce of eggs.

(33d QUE.) When chryſalides come out of the cocoons under the form of butterflies, how are the males to be diſtinguiſhed from the females? Is it neceſſary to help their copulation?

(ANS.) It is very eaſy to diſtinguiſh the males from the females: the firſt *are ſmall, ſharp pointed* and more active, the laſt being full of eggs, are bigger, heavier and round.

As to the ſecond part of this query, we may ſay that art in this caſe ought to concur with nature. As theſe butterflies are very heavy, and live but few days, there is no doubt that many females would lay their eggs without meeting with males; therefore, it is neceſſary to take the lazy males by their wings, as gently as poſſible, in order to carry them to the females upon a bit of black cloth; let them be united for about four hours, afterwards throw away the males, and leave the females only till they have laid their eggs.

Theſe eggs ought to be expoſed to the air two or three days, in order to dry them; after which, roll them up upon the cloth, put them in a freſh room during the ſummer, and out of the reach of the froſt in the winter.

(34th QUE.) Beſides the four moultings of ſilk worms which may be looked upon as a kind of natural diſeaſe, are they not liable to ſome other diſorder?

(ANS.) Generally ſpeaking, careleſſneſs, neglect, or want

of ſkill in raiſing room ſilk worms, bring upon them the greateſt part of their diſorders; however it is neceſſary to be acquainted with thoſe different diſorders.

1ſt. Some worms turn fat, and are eaſily diſcovered in the time of every moulting, becauſe they never undergo that natural change peculiar to the good worms, as ſtated in our 15th query. The fat worms inſtead of remaining ſtill or motionleſs in the time of moulting, are moving about and eating; they continue to grow and are eaſily diſtinguiſhed, being a great deal whiter and looking oily; they muſt be thrown away for fear they ſhould ſpoil the others: beſides, as they periſh ſooner or later, it would be an uſeleſs trouble to feed them longer.

2d. This ſecond diſorder is quite the reverſe of the firſt. After the third or fourth moulting, ſome worms become lean, they refuſe to eat; then turning ſoft, ſmaller and ſhorter by half than they were before: they muſt die in the courſe of three or four days, as in a conſumption.

3d. The yellow worms never appear but a little before the time of ſpinning, inſtead of becoming mature, they ſwell up, and you may perceive ſeveral naſty yellowiſh ſpots, on their head firſt and ſoon after ſpreading all over their body; they muſt be thrown away.

It is eaſier to deſcribe thoſe diſorders, than to point out the

remedy: and indeed after many expenſive trials, it has been found more advantageous to throw away worms taken by one of theſe diſorders, than to let them contaminate the others, as every attempt to cure them fell ſhort of ſucceſs. *

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* Since the deſcription of the above mentioned diſorders, I was favoured with information of an experiment made in this ſtate, by which it appears that this climate is more friendly to the ſilk worm, than that of Spain or France. Out of 6000 worms raiſed by Mrs. Montgomery, very few died in the courſe of their education; and it is worth while to obſerve, that no greater loſs happened in the preceding years. Therefore, what an immenſe advantage have we over Europe in raiſing of ſilk worms, where (upon a common average) four fifths of the worms periſh before their ſpinning!

What powerful encouragement to you, happy people of this country, when certain of obtaining complete ſucceſs, you may reap in the courſe of ſix weeks ſuch an affluent crop! Oh bleſſed land! Oh ten times fortunate Americans, could they but know and improve their natural and local advantages!

## PART II.

### ON THE RAISING OF SILK WORMS, IN OPEN AIR UPON HEDGES.

*BY PETER DELABIGARRE, Esq.*

AFTER a long and tedious deſcription of the various cares and expences attending the beſt mode of raiſing ſilk worms within doors, we feel an agreeable relaxation in relinquiſhing art, to come into the arms of nature.—Let us play with her eaſy ways; let us admire how little trouble is required to obtain plenteous favours from her rich boſom!

The firſt ſtep is to have a white Mulberry hedge, three years old at leaſt, and four or five feet high. For the mode of planting ſuch an hedge, we would have referred our readers to a communication made to the Agricultural Society of New-York, *on the utility of white Mulberry trees in making hedges*; but conſidering the trouble of getting that communication among ſo many other pieces preſented to the ſociety, we thought it preferable to give here an extract of it, with ſome neceſſary additions.

Around the field to be encloſed, dig a ditch three feet wide and two feet deep, in the fall of the year: then in the month

of March or in the beginning of April, as ſoon as the froſt is out of the ground, give a light hoeing to the bottom of your trench. The longeſt roots of your plants being cut off near the hairy fibres, they muſt be planted about eighteen inches deep, at the diſtance of three or four inches from each other; after the trench is filled up, every ſhoot muſt be cut at the height of two or three inches above the ground; whether the plant is big or not, is no matter, provided it is at leaſt one year old; obſerve only to give the preference to the white mulberry as the food of ſilk worms.

The ſecond year it is neceſſary to cut again the ſhoots about ſix inches above the ground, in order to give more ſtrength to the ſprouting branches, which will form a pretty ſtrong hedge the third year, and at laſt grow ſo thick as to be impaſſable for any cattle: it may be twiſted and interwoven a great deal eaſier than the hawthorn. If you chuſe to make a ſtronger hedge, you may plant it in a double row.

Since this communication was written, we are happy in informing our readers, that laſt March, after the planting a mulberry hedge according to the above directions, we ſtuck along ſide of it ſome remaining ſlips of our plants to form a double row: and though theſe ſlips had been thrown away and laid out of the ground for ten days before we thought of making that trial, we perceived with a pleaſing ſurpriſe, that the greateſt part were putting forth leaves, and are now actually growing as well as the rooted plants themſelves.

Therefore, ſuch a ſaving, will make the planting of white mulberry hedges, if not cheaper, at leaſt as cheap as thoſe of any other wood, if we except only the willow tree. Then from this already acquired improvement, you may make your hedges as ſtrong as you pleaſe.

At any time or at any age of your hedges, if ſome place become vacant, or feeble, you can eaſily replace it with a few ſlips.

For three years the young hedge muſt be defended againſt the cattle by a proper fence, like every other plantation of the kind; the ground muſt be worked and kept clear from weeds every year after. It is neceſſary to keep conſtantly the hedge at the height of four or five feet, as the moſt proper for the raiſing of ſilk worms.

No wood grows quicker than the mulberry tree; you may remark that after the firſt leaves have been employed in the ſpring to feed the ſilk worm: the other leaves of the fall may be gathered, and when dry, they afford a good fodder for cattle.

The objection will be, the difficulty of getting thoſe young mulberry plants to make hedges with. They muſt be bought in ſome particular nurſeries, like thoſe in New-Jerſey, upon Long-Iſland, &c. However, any farmer not wiſhing to go to that expence, may eaſily raiſe the plants from ſeeds, in the following way:—

Gather all the ripe berries fallen down under the white mulberry tree, put them for two days in a dry place, where they muſt be turned up and down for fear they ſhould be heated. After which you muſt waſh them with your hands in a tub, pouring over ſome water from time to time, in order to ſeparate the ſeeds from the muſt. Let then the water ſettle for a quarter of an hour, and all the uſeleſs particles floating above may be poured off. You muſt repeat the above waſhing till the ſeed is well diſengaged and pure. The beſt ſeed being the heavieſt, will always ſtay at the bottom of the tub. This being done, ſpread all the good ſeeds to dry upon a bit of linen; when dry, keep them in a cloſet till the proper ſeaſon for ſowing. Obſerve, that this kind of ſeed never keeps longer than one year. The beſt time to ſow the Mulberry is in the beginning of April.

Some people pretend that the ſeeds grow very well when ſowed in the very trench made for the hedge, but a long experience teaches us, that it is better to raiſe the plants in a nurſery where the ground is rich and well manured: you will chooſe for that purpoſe, a place ſheltered from the north and cold winds; that place muſt be digged and prepared before the winter. The beſt way is to make a bed four feet wide only, in order to be able to water it and pick the weeds out, without trampling upon the ſeed's-bed. Before you water the ſeeds, you muſt ſpread over ſome light ſtraw to prevent the

ground from becoming too hard, which otherwiſe would be an obſtacle to the raiſing up of the young plants.

The plants are fit to be tranſplanted the following year, in the trenches intended for hedges, after the manner and at the time above mentioned. The mulberry grows in every ſoil, but it delights in a rich ſandy ground.

(1ſt QUE.) What is the moſt proper hedge to feed the ſilk worms upon?

(ANS.) An hedge three years old begins to be fit for the worms; but we muſt own, that one or two years older, will produce more leaves of a ſtronger ſubſtance and affords a ſtronger ſhelter for theſe inſects. The thickneſs of the hedge is a great advantage to the ſilk worm, in rainy or boiſterous weather; beſides, they climb upon branches well interwoven, they hide themſelves better and reſt more ſecured, than upon rare and thin branches.

(2d QUE.) Do you put the eggs or the worms already come out, upon the leaves of the hedge, and how?

(ANS.) It is obvious, that the eggs ſhould never be hatched in open air, when we know that the hatching requires an equal and conſtant degree of heat, even at home. Therefore you muſt follow the directions mentioned in the firſt part, as well for the choice of the eggs as for their hatching; beſides, you muſt not expect that the young worms could be put o

the hedge before two or three days after the firſt moulting; then chuſe mild weather, and as fine a day as poſſible, to take your worms upon ſome leaves as directed in the 20th query of the firſt part, and in that way, carry and put them on the freſh leaves of the hedge, taking care not to ſpread them too thick; about one hundred will be ſufficient for the ſpace of thirty feet in length, if the hedge is young yet and thin, but more in proportion to the age or to the thickneſs of your hedge.

(3d Que.) If your ſilk worms upon hedges are not attacked by other inſects, will not they be picked up by the birds which are in ſuch great numbers in this country?

(Ans.) Though we have not remarked that birds are fond of our ſilk worms, we are ſatisfied that they may be eaſily defended againſt them. Suppoſing that among ſuch a variety of birds, ſome are deſtructive of our worms; then you may ſpread an old net over the hedge, or fix ſome rows of twine all along with a few pieces of rags at proper diſtances; any kind of ſcare-crow will keep the birds away. It is eſpecially neceſſary to overlook the hedge before you put on your worms, in order to deſtroy all the neſts, or rather not ſuffer any bird to ſet his neſt on in the beginning of the ſpring. By that little and unexpenſive attention, you will not be injured by the birds.

(4th Que.) Are worms raiſed upon the hedges, liable to the diſorders common to thoſe raiſed within doors? And what

care or attendance do they require after being put on the hedges?

(Ans.) It is proved by experience and beyond any doubt, that worms raiſed in open air are free from every diſorder; their only fate depends upon the ſeaſon: but as the temperature from the fifteenth of May to the fifteenth of July, is a great deal finer and more moderate here than in Europe: above all, as we have very few inſtances of ſhowers of hail, which are ſo frequent and ſo deſtructive in other countries, we remain perfectly ſatisfied, that ſilk worms will ſucceed and thrive beyond our expectations in this bleſſed part of the world. Therefore, as ſoon as they can be ſecured againſt the voracioufneſs of certain birds, you may leave them to the bountiful hand of nature; you need not afterwards take any more care, they muſt do, and they will do very well for themſelves.

The only thing which you have to do, is to enjoy the pleaſure of paying them a viſit from time to time.—Like the happy farmer contemplating his promiſing harveſt, you will look at the growth and progreſs of your induſtrious worms; you will watch the time when they will have completed their ſpinning;—Is it done? Come and collect with a thankful hand, the cocoons hanging on the twigs of your hedge, like the golden fruit of the Heſperian garden.

## EXPERIMENTS

## ON WHEAT, CLOVER AND LUCERNE,

SUBMITTED TO THE SOCIETY FOR PROMOTING AGRICULTURE AND USEFUL ARTS:

*BY JOHN STEVENS, of Hoboken.*

THE cultivation and management of a field of about ten acres:

No. 1. About three and a half acres, part of the above, is a loamy ſoil, which having a N. W. expoſure, is rather inclined to be wet and cold in the ſpring. In the month of May of 1792, planted it with Indian corn, manured in the ordinary way, with farm-yard dung in the hills. The crop was a good one. The latter end of October, cut it up cloſe to the ground, and carried it off. Then gave the whole a good dreſſing—part with farm-yard dung—part with heated aſhes, and part with ſtreet dirt; gave it one ploughing, and harrowed in three and a half buſhels of wheat. In the month of March following, ſowed the whole with thirty pounds of red clover; and on an acre of the drieſt part inclining to ſand, ſowed at the ſame time about 8 pounds of lucerne ſeed. The wheat turned out a much better crop than I had expected from its appearance in the fall; for it was manifeſt to the eye, that it had not been ſufficiently ſeeded. My overſeer has rendered me an account of eighty one buſhels

of clean wheat; but as the crop had after harveſt been put up in a barrack where great depredation had been made on it by poultry, hogs, &c. and conſiderable waſte accrued from threſhing on an open temporary floor, I ſhould ſuppoſe the product might be fairly eſtimated at one hundred buſhels, which is at the rate of about twenty eight and a half buſhels per acre. Although the ſeaſon was remarkably dry, the clover came on after harveſt, at an aſtoniſhing rate, and as I was under the neceſſity of keeping up the field, it was not paſtured as uſual. In the beginning of October, the clover was cut, and notwithſtanding the ſtubble prevented it being cloſe, the product was as nearly as I could eſtimate at leaſt four tons. One four ox load was taken into the barn; the remainder was taken immediately from the field to the boat, and delivered from thence into my ſtable in New-York. I have kept a pair of horſes and a cow on it ſince the beginning of January, and expect it will laſt me till April.

As to the part ſown with the lucerne ſeed: On the far greater part of it the ſeed failed altogether, and the few ſolitary plants that here and there made their appearance were evidently ſtunted and overpowered by the clover.

No. 2. About three acres were ſown in the ſpring 1792, with oats, and produced a tolerable good crop. In the ſpring 1793 it was manured with ſtreet mud, and ploughed, I believe but once, and ſown with barley and clover; over a

part of it, lucerne ſeed was alſo ſown, but in what proportion of ſeed per acre I cannot now aſcertain. The crop of barley was a miſerable one. It came up very thin, and, as the ſpring was wet, the manure brought forward an ample crop of weeds, with which at harveſt the ground appeared to be completely covered: however, towards fall, the clover began to make a pretty good appearance. Although the lucerne has come up better than on No. 1, it is too thinly ſcattered to promiſe hope of any thing like a full crop. That part of No. 2, on which the lucerne was ſown is more ſandy than No. 1.

No. 3. About three acres may be called a ſandy ſoil. In 1792 it was partly in corn, and partly in potatoes. In the ſpring 1793, it was well manured with ſtreet mud, and ploughed, I believe, but once, and ſowed with barley about the laſt of April. Twenty-five pounds of lucerne ſeed was at the ſame time ſown over the whole of it, without any clover ſeed. The barley turned out very indifferently, though better than No. 2. Although the ſoil was ſandy, it was much infeſted with weeds.

The lucerne, in ſome parts of the piece, came up pretty well, though I ſhould ſuppoſe not thick enough for a full crop the enſuing ſeaſon. In many parts, it ſtands very thin, and in ſome places it has failed altogether, particularly in thoſe places where the manure had been thrown in heaps out of the cart, the weeds had almoſt entirely overpowered both barley and

lucerne. The lucerne was not paſtured 'till after the clover was taken off of No. 1, which was early in October. It was then in many parts of the field upwards of two feet high, and in full bloom. And though I am perſuaded in my own mind, it would not have yielded ſo large a crop as the clover, even if it had ſucceeded equally as well, yet, as it was, the paſture it afforded was very conſiderable. The whole field, from the time the clover was off, till late in November, ſupported five head of fatting cattle, and three horſes. The cattle throve greatly, although at that ſeaſon the paſtures were every where in the neighbourhood, almoſt entirely dried up, owing to a ſevere and long continued drought.

I ſhould by no means have troubled the ſociety with any thing reſpecting theſe experiments in the preſent ſtage of them, as lucerne is ſaid to require at leaſt two years to attain to any degree of perfection; but although theſe experiments, as yet, can afford no concluſive inferences reſpecting the ultimate profit of a lucerne crop, yet I apprehend ſome important deductions may be drawn from them.

1. From the almoſt total failure of the lucerne on No. 1, we may fairly conclude, that the ſeed was committed to the ground *too early* in the ſeaſon, eſpecially as the clover that was ſown with it ſucceeded ſo well.

2. The indifferent appearance of No. 2, may, I preſume, be attributed, principally, to the want of a proper melioration of the ſoil. A fit matrix for vegetation was thereby, in the firſt

place wanting, and, in the next place, the plants of thoſe ſeeds which did vegetate, were nearly ſuffocated by weeds.

3. The luxuriant growth of the lucerne on No. 3, would countenance a concluſion that lucerne may ſucceed very well when ſown on barley *without* clover.

4. Upon the whole, theſe experiments, as far as they go, indicate, that lucerne ought not to be ſown *early* in the ſeaſon—perhaps midſummer may prove the fitteſt time for ſowing it. That every care ſhould be taken to render the ground as mellow and as free from weeds as poſſible, and that therefore it would be moſt adviſeable to prepare the ground the ſucceeding year, by a crop of potatoes, pumpkins, or other horſe hoed crop, with which a generous coat of manure ſhould be laid on, ſo as to ſupercede the neceſſity of manuring the lucerne, except, perhaps, with a top dreſſing of aſhes, &c.

Perhaps no one ſubject of rural œconomy will eventually prove of more importance to the American agriculturiſt than the culture of lucerne. From the habits of the plant it appears admirably fitted to our climate. It requires heat and endures drought—And on a ſoil properly adapted to it, it will laſt from a dozen to twenty years in full perfection.

I mean the enſuing ſpring to make further experiments on this noble plant, and to note minutely the progreſs of thoſe I have already began—and hope I ſhall be able to furniſh the ſociety with a more ſatisfactory detail of facts on this ſubject than is contained in the preſent memoir.

*On the* CULTIVATION *of the* TALL-MEADOW-OATS (avena elatior) *for paſture and Hay; — and on* GYPSUM *and* STONE-COAL *as a Manure.*

*Communicated by the Rev. Dr.* Henry Muhlenberg, *of Lancaſter (Pennſylvania) to Dr.* Mitchill, *dated May* 15, 1793.

DEAR SIR,

MY brother Frederick Auguſtus Muhlenberg informed me you would be glad to ſee ſome ſeeds of the graſs he mentioned and recommended to you at New-York. I have cultivated the ſame a number of years from imported ſeed, and find it, after a great many trials of pretty near all other graſſes, the earlieſt, lateſt, and beſt graſs for green fodder and hay. It bloſſoms in the middle of May, the ſame time with the common red clover, and the ſeed ripens a month after. Horſes, it is true, do not like it green, at leaſt not all of them, but eat it in hay. Horned cattle prefer it to all other graſſes. It will grow beſt in clover ſoil, and the leaves are from two to four feet high before it bloſſoms; in the bloſſom the ſtalk riſes from five to ſeven feet. It ought to be cut in bloſſom about the end of May or beginning of June, and will yield an abundance of ſweet good hay. The ſeed may be ſown in the fall or ſpring, with or without grain, and muſt be bruſhed in or lightly harrowed. If mixed with clover, it will make uncommon good upland meadow. The name of the graſs is *avena elatior*

(Linnæi) the *wieſenhafer franzoſiſch raygras* of the Germans; or, in Engliſh, TALL-MEADOW-OATS. A very good figure and deſcription is given in SCHREBER's *Abhandlung und Abbildung der Graſer, vol.* 1. *tab.* 1.

I ſend you ſome ſeed, and adviſe you to ſow it in a good ſpot of your garden. I began with leſs ſeed than I ſend you, and have now laid down ſeven acres for it.—We have a number of other good graſſes which deſerve to be cultivated. According to my trials, they range in this order:—1. Tall-meadow-oats, or tall-oat-graſs *(avena elatior,* imported.) 2. Tall-feſcue-graſs, *(feſtuca elatior,* native.) 3. Meadow-fox-tail-graſs, *(alopecurus pratenſis,* imported.) 4. Meadow-ſoft-graſs, or Yorkſhire graſs of the Engliſh, *(holcus lanatus,* native.) 5. Timothy or meadow-cats-tail-graſs, *(phleum pratenſe.)* 6. Rough-cocks-foot-graſs, *(dactylis glomerata,* native.) 7. Engliſh or common rye-graſs, *(lolium perenne,* imported). 8. Sweet-ſcented-vernal-graſs *(anthoxanthum odoratum,* imported.) 9. Reedy-cinna *(cinna arundinacea.* native.) 10. Broom-graſs, two ſpecies, *(bromi)*—All thoſe ſhould be cultivated with Timothy in our bottoms or meadows which can be watered. As for upland meadows I would prefer clover *(trifolium pratenſe)* lucerne *(medicago ſativa)* and ſaint foin *(hedyſarum onobrychis.)* The firſt is certainly the beſt preparation for a good crop of wheat, if well managed.

For many years, I have wiſhed that our American patriots

might join hands, and the literary and intelligent men of this country might have more intercourſe. How much could be done for the proſperity of theſe States! We do not know the half of our riches. Agriculture will, I hope, be our chief ſtudy, and be the means to raiſe the Americans, amongſt the firſt nations of the earth. Manufactures are now indeed in their infancy, but the many good materials we have in this country, promiſe more encouragement if we learn to know and eſteem them,

The gypſum has had many fair trials in our neighbourhood, and on dry poor lands has always anſwered our expectations. I could never obſerve any effect on dry or well-manured lands. Clover, oats, and indian corn, agree beſt with it. Apple-trees have likewiſe been much benefited. We ſow it early in the ſpring, three or four buſhels to an acre, before we expect rain. I made a number of experiments with gypſum, and never found any harm; but we muſt import it; and, as an American, I wiſh a ſubſtitute. I think pulverized *lime-ſtone* is of the ſame ſervice, and ſome of our lime-ſtones are eaſy pounded, and uſed in the ſame manner as gypſum. If Mr. MEYER (the firſt that uſed gypſum and recommended it ſo warmly to the world) is not miſtaken, STONE-COALS *pulverized, are ſafer and go further in meliorating the lands than gypſum.* I heartily wiſh ſome of your agricultural friends would make an experiment with our *American ſtone-coal*; 400lbs. are neceſſary to 180

ſquare perches. Should theſe experiments prove ſucceſsful, as I do not doubt, what a noble acquiſition would our ſtone-coals be! At preſent they are too dear, but when the Suſquehanna is improved, I expect they will be exceeding cheap. I have a very valuable treatiſe on theſe mineral manures, written lately by a German chemiſt, RUCKERS.

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THE Society is very happy in hearing that a part of the valuable life and learned labours of Dr. MUHLENBERG are employed in making out a "Hiſtory of the Graſſes;" ſince from the agricultural ſkill and botanical knowledge of this gentleman, ſuch a work may be expected to be highly uſeful, both to the man of ſcience and the practical farmer.

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The ſmall work of WILLIAM CURTIS, containing practical obſervations on the Britiſh graſſes, beſt adapted to the laying down, or improving of meadows and paſtures, to which is added, an enumeration of the Britiſh graſſes, has been received by the Society; and the following abſtract made from it, is offered to ſuch of their fellow-citizens as cannot procure the original: Mr. Curtis begins by obſerving, that much meadow and paſture land may be rendered infinitely more valuable than it is at preſent, by the introduction of ſome of their beſt graſſes, and obſerves, that neither the ſoundeſt reaſonings nor beſt directed premiums have ſucceeded in exciting the huſbandman to collect and cultivate ſeeds of this ſort, and laments

ſeriouſly that many of the uſeful hints in ANDERSON'S *Eſſays on agriculture and rural affairs* are rendered abortive from his want of botanical information. He thinks it extraordinary, that out of more than an hundred graſſes, ſtrictly ſpeaking, growing in Britain, rye-graſs, however inadequate for the purpoſe, is ſtill the principal one employed in laying down lands. Out of this variety Mr. C. has ſelected ſix, which he is confident will do all that their natural graſſes can do; they are choſen from among thoſe that conſtitute their beſt paſtures; moſt of them being early, all of them productive, and adapted to ſuch ſoils and ſituations as are proper for meadows and paſtures.

After cautioning his readers not to expect wonders, he gives a conciſe account of each of the ſix graſſes with a copper-plate annexed. They are the following: 1. Sweet-ſcented-vernal-graſs, (anthoxanthum odoratum.) 2. Meadow-fox-tail-graſs (alopecurus pratenſis.) 3. Smooth-ſtalk-meadow-graſs (poa pratenſis.) 4. Rough-ſtalked-meadow-graſs (poa trivialis.) 5. Meadow-feſcue-graſs, (feſtuca pratenſis.) 6. Creſted-dog's-tail-graſs, (cynoſurus criſtatus.) The order of their flowering is the ſame with that of their preſent enumeration. And he obſerves, that the meadow-fox-tail and rough-ſtalked-meadow-graſs are fitteſt for moiſt lands; the meadow-feſcue and ſweet-ſcented-vernal, for land either moiſt or moderately dry; and the ſmooth-ſtalked-meadow-graſs and creſted-dog's-tail, for dry paſture.

The culture of theſe graſſes being particularly recommended

in preference to others, Mr. C. goes on to give a conciſe account or character of twenty-ſeven other graſſes, derived, as he ſays, from fourteen years culture and obſervation. Among theſe he mentions the tall-meadow-oats as being early, productive, and affording a plentiful after-math.

The author proceeds next to give practical directions for ſowing the ſeeds which he recommends. From the numerous applications made to him by a variety of gentlemen, for graſs-ſeeds, it appeared incumbent on him to do ſomething which might gratify them, and render the public an eſſential ſervice. He has accordingly provided aſſortments of ſeeds put in packets, ready for ſowing; each kind of ſeed being in that proportion which ſuits beſt. At the end of this chapter, Mr. C. obſerves, that common worms, by "throwing up great quantities of earth, contribute greatly in meadow lands to prevent the growth of moſs, as well as to afford freſh ſoil for the roots of plants to ſhoot into, and for ſeeds to vegetate in:" He calls them "the natural diggers and dungers of land; worm caſts being nothing more than the dung of the worms."

Then follows a botanical arrangement of the Engliſh graſſes in twenty-five genera, with the Trivial and Engliſh names annexed; and the work concludes with an appendix, containing hints relative to the improvement of meadows, in reſpect to their produce, bateableneſs and early growth.—The packet of graſs-ſeeds may be had at No. 3, St. George's Creſcent, near the Obeliſk, Black-Friar's Road, London, price half a guinea.

## On the DECAY of APPLE TREES.

*From a* Letter *of* William Denning, *Esquire, to* Mr. Mitchill, *dated December* 22, 1793.

Dear Sir,

IT is undoubtedly of conſequence to the farmers of this country, as well as to others, that the cultivation and preſervation of apple trees, be duly attended to. It is therefore with great concern, that I have marked the progreſs of a diſorder, prevailing and increaſing in this valuable and uſeful tree, for many years, without having it in my power to deviſe a remedy.

As no obſervations have as yet appeared on this intereſting ſubject, I hope my giving you the trouble of my remarks thereon may be attributed to my wiſh for the preſervation of thoſe trees; which I hope may be effected by ſome ingenious invention or diſcovery adapted to the novelty and urgency of the diſeaſe. I firſt obſerved it in my orchards in the vicinity of Hudſon's river, north of the Highlands, in the year 1780. I have ſince obſerved its baneful progreſs further ſouth. And, if I am not miſtaken, it is ſpreading rapidly. I have obſerved it alſo, attacking pear trees and quince trees, to the total deſtruction of them in a few years: and as theſe trees are of a ſlow growth, the loſs, is of courſe irreparable to the preſent proprietors.

A long time this diſorder baffled my moſt critical reſearches. As I obſerved the young, remote, and tender ſhoots firſt affected, I traced the malady to the ſpot where the ſap ceaſed to flow, but could diſcover no external cauſe. On the ſecond year I found the boughs wounded deeper, and progreſſing yearly, the trees continued to ſicken, and in ſix or ſeven years died. It is to be obſerved, that every ſpring the trees appear in full vigour (except the limbs already periſhed from the former years attacks) and continue ſo until the latter end of June, or beginning of July, when ſuddenly the leaves wither, turn red, and ſoon fall off; the whole tree appears ſick, and the fruit full of ſpots, and unpromiſing; hence the indifferent appearance of many of our apples brought to market for ſale, few of them being fair and ſmooth as they formerly were.

As ſoon as the leaves fall off, as above deſcribed, it will then appear how far the tree is affected for this ſeaſon.

Finding all my efforts to diſcover the cauſe in vain, I hazarded ſeveral experiments; among others, two years ſince, I laid bare the roots of two favourite pear trees in the month of October, and left them ſo until May following: one of theſe trees was ſo injured, that I had no hopes of its recovery. Laſt year they ſhewed few or no additional ſymptoms of the diſeaſe, were very full of fruit, and had a great ſupply of new ſhoots; this year, both trees were very

full of fruit, tho' again they diſcovered ſymptoms of the diſorder, but not in ſo great a degree as in former years.

Still purſuing my enquiries, I have had ſome apple trees cut down, that were far decayed. In the firſt I diſcovered two worm holes, running perpendicular from the tap-root up through the heart; theſe holes were large enough to admit a common pipe-ſtem, and reached about fourteen inches above the ſurface of the ground, and from each hole I ſcrewed out a worm. All the other trees I found perforated with worm-holes, ſuch as have been already deſcribed, and in ſome to the number of eight or ten. Having extracted ſome of theſe worms entire, I find them *nearly* of the ſame ſize and ſpecies of thoſe ſo common and ſo well known to be the conſtant attendants on peach trees; indeed ſo ſimilar are they to thoſe worms, that I am of opinion, they are of the ſame kind.

I have loſt ſeveral valuable trees by this moſt pernicious worm, and my whole orchard is in a ſtate of decay. This diſorder appears to me to be of a more ſerious nature than any thing that has ever infeſted orchards. The canker-worm, only deſtroys the leaves and fruit for the ſeaſon, and perhaps every fourth year, if not attended to when a fly; but this worm radically deſtroys the tree itſelf. I have inquired of many farmers in my travels, whoſe orchards I have obſerved in this ſtate, what they ſuppoſed the cauſe of it? they generally anſwered, the trees were blaſted by lightning, and this I found

to be the prevailing opinion; none of them, of courſe thought of ſearching for the true phyſical cauſe.

As I am confident I have diſcovered it, the next ſtep is to find a remedy; as I have not yet ſucceeded, I ſubmit it to the conſideration of the Agricultural Society, whether a publication of the real cauſe of the diſorder may not lead to a diſcovery that may tend to ſtop the ravages of this worm; and perhaps induce many, whoſe intereſt it is to preſerve their trees, to attempt to ſecure them from its fatal attacks. To lay bare the roots of a large orchard, every autumn, would undoubtedly be attended with great trouble and expence, yet even that would be eaſier than to raiſe another orchard. And I have beſides, obſerved very young trees, even in nurſeries, ſicken from the ſame cauſe.

## ON THE EFFECTS OF THE SHADE OF TREES UPON VEGETATION.

*Extract of two Letters from the Honourable* ROBERT R LIVINGSTON, *Eſquire, to Mr. Mitchill.*

Clermont, 17*th*, *Sept.* 1792.

DEAR SIR,

THE plans that I had projected of Agricultural improvement for this year, have been fruſtrated by the building a country houſe, which has occupied my attention and the labourers that I uſually employed upon my farm, ſo that I ſhall be able to offer nothing on the ſubject of experimental huſbandry that will merit your attention, unleſs it be an obſervation which I have frequently made, but with more attention this year than before, and which may, I conceive, if properly purſued, lead to important conſequences. I mean the baleful effect of the *ſhade* (if I may ſo call it) of ſome trees, upon the vegetation of corn. I will ſtate the facts as they have appeared to me, and you will the more readily comprehend my ideas. I planted maize on the weſt ſide of a young wood, conſiſting of oaks, poplars, a few cheſnuts, and a large mulberry ſomewhat advanced into the field; the ſhade made by the riſing ſun, extended nearly acroſs the field, and was not entirely off until about 10 o'clock; I remarked, that as far

as the ſhade of the cheſnut reached, the corn was extremely injured; it was yellow and ſmall; the conical ſhape of the morning ſhade from particular trees, might be traced a conſiderable extent, in the ſickly appearance of the plants; the black oaks were likewiſe injurious, but leſs ſo than the cheſnut; the poplars very little ſo.—Near the mulberry tree, the corn was covered by its ſhade for a very long time every morning, and tho' not ſo large as that which had more ſun, maintained a healthy appearance. To what cauſe are we to attribute this phænomenon? it is certainly not the *mere abſence of light or heat;* for in this caſe the trees would have been equally injurious, or rather the mulberry would have been moſt ſo. It is not *to any dropping from the trees;* for the corn grew *under* none but the mulberry. It is not to *any effluvia from the trees;* for this would either be emitted in circles, or wafted irregularly by the wind; whereas the ſhape of the ſhade was plainly traced upon the corn. Were I permitted to form a conjecture upon this extraordinary circumſtance, I ſhould conclude, that the miſchief was not occaſioned by the *ſhade*, but by thoſe rays of light that actually paſſed through the tree, either *perforating the leaves* (for none of them are perfectly opake) or *being brought into contact with them;* and that this light ſerved as a menſtruum, to diſſolve certain parts of the tree noxious to corn, and as a vehicle to convey it in the direction of the rays (which neceſſarily are that of the ſhade) As the injury is done in the line in which

the direct rays of light paſs through the tree, it muſt follow, that neither *air* nor *water* are ſolvents for this body; for if they were, it would be wafted in different directions. If this idea is juſt, what a field does it open for important diſcoveries? To how many *medical purpoſes* may this new menſtruum be applied? The only properties of vegetable ſubſtances with which we are acquainted, are thoſe that we collect from the application of the whole plant, or a ſolution of it in water or ſome other liquid. By the firſt of the means, we may indeed obtain thoſe parts which *light only* can diſſolve, but mixed with various ſubſtances which may probably counteract the effect. By the laſt, this matter, whatever it may be, cannot be obtained. Many plants that are conſidered as poiſonous, when ſubjected to this trial, may be found to contain a ſalutary ſubſtance, and the rays of the ſun paſſing through them, be made to convey health and vigour. Should theſe conjectures be verified by experiment, the *Phyſicians* may again claim APOLLO for their patron, after having long abandoned him to THE POETS, to whom indeed they will ſeem, in ſome ſort to aſſimilate themſelves, when, inſtead of *pills* and *powders*, they ſhall preſcribe *zephyrs* and *ſunbeams*. Will not this fact, in ſome meaſure, account for another, which ſeems well eſtabliſhed by Dr. Ingenhouz, to wit, that the effluvia of plants are ſalutary in the light, and hurtful at night? The facts I have ſtated are confirmed by a variety of intelligent farmers, to whom I

mentioned by obſervations. General Schuyler, upon my expreſſing my ſuprize at the circumſtance, told me, he had long ſince obſerved, that the ſhade of the *black-oak* was particularly noxious to wheat. To indian corn, it appears to be leſs ſo, than cheſnut. The *ſhade* of the locuſt (I am compelled to uſe this term, though as you ſee it does not expreſs my idea) is well known to be extremely beneficial to graſs grounds.—Think of ſome mode of TRYING ITS EFFECTS UPON THE ANIMAL SYSTEM.

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Clermont, 11*th Auguſt*, 1793.

DEAR SIR,

I HAVE, ſince I ſaw you, been confirmed in my conjectures relative to effect of light paſſing through certain ſubſtances, by the following experiment:—I ſelected a ſpot of ground, of one hundred yards long, and eighteen wide near the centre; on the weſt ſide (the length of the ground laying from north to ſouth) was a tall cheſnut tree, which I trimmed up, ſo as to make the ſhade of the head fall at ſome diſtance from the tree, when the ſun was about forty degrees from the horizon on the ſouth weſt end of the ground ſtood a cheſnut and a black oak. On the ſouth end, and only eighteen yards from them grew a clump of mulberry trees, and one large apple tree; the ſhade caſt by the two laſt from 9 to 11 o'clock nearly meeting with that caſt by the oak and cheſnut from

1 to 3. This ground I sowed with buckwheat, on the 1st of July, from a persuasion, that the *mere absence of a portion of light*, at a season of the year, when the days are very long, and the sun inconveniently hot (particularly to buckwheat, whose blossoms drop off without producing grain, if the heat of the summer's sun is for two or three days untemperated with clouds) could not be very prejudicial to this plant, or at least that the shade of trees at each end, which were equally thick, would be, in that case, equally prejudicial. *The contrary however, is the fact.*—Gypsum having been strewed over the field, the whole has such a degree of luxuriance as I have never before seen; the buckwheat is upwards of four feet high, as well where it is shaded by the *mulberry and apple trees*, as where it has *no shade*.—Where the shade of the *block oak* falls, the colour is less healthful; but the spots shadowed in both parts of the field by *the chesnut trees*, if mown at this time (because now in blossom) would not, I am satisfied, produce half the weight that the same space of ground would yield in any other part of the field, not even excepting that shaded by the apple and mulberry trees, which is however inferior to the rest of the field; this I attribute to the apple shade (though it is too much united with the mulberry to be distinguished) since I have before found, that the shade of the apple tree was hurtful to Indian corn. You will observe that my experiments *last*

*year*, were drawn from *cheſnut trees* ſtanding on the *eaſt ſide* of a *field of corn: this year*, from thoſe which grow on the *weſt* and *ſouth weſt ſide* of the *buckwheat*: This experiment which I have made with attention under the moſt favourable circumſtances, as well with reſpect to the poſition of the trees, the nature of the vegetable and the ſeaſon of the year, have confirmed me in the theory I hinted to you; that the injury which ſome vegetables receive from the ſhade of certain trees, is not owing ſimply to the diminution of light, but either to a change the light undergoes in paſſing through them, or from its diſſolving and becoming the vehicle of ſome ſubſtance noxious to certain plants contained in the tree, through which it paſſes. There are few facts in phyſicks that do not admit of ſome uſeful deductions; I have taken pains to eſtabliſh this, that you, or ſome other chymiſt of more leiſure and equal information may make them.

## FRENCH AND ENGLISH MEASURES COMPARED:

*BY PETER DELABIGARRE, Eſq.*

IT may not be uſeleſs to be acquainted with the references of the French meaſures to thoſe of this country, as far as it can help farmers in their reſearches on various improvements and proceſſes made in foreign agriculture.

We find often in different treatiſes the names of meaſures which are not evaluated according to thoſe uſed where we live: therefore, without ſuch calculated references we are unable to determine our judgment or to balance an exact reſult, whether advantageous or not.

The Engliſh foot ſtands for 11 inches 3 lines and 25-100 of a line of a French foot.

Fifteen ſquare French feet are equal to ſeventeen Engliſh. Two acres of different extent are generally uſed in France; one for arable lands, the other for woods and foreſts.

The firſt is compoſed of 100 rods, but each rod of 18 feet ſquare, which gives 900 ſquare fathoms to an acre.

The ſecond contains 100 rods, each rod of 22 feet ſquare, which gives 1344 ſquare fathoms.

Thus an Engliſh acre containing 1135 ſquare French fathoms, has 209 fathoms leſs than the foreſt-acre above mentioned.

The Engliſh yard contains only 2 French feet 5 inches 9 lines.

The Engliſh mile of 1760 yards is equal to about 825 French fathoms, as the fathom is equal to 76 3-4 Engliſh inches.

The Engliſh gallon of grain contains 222 cubic French inches.

Two gallons make a peck, which is the quarter part of a buſhel, and contain 444 cubic French inches.

The Engliſh Buſhel, as uſed in London, contains 1778 cubic French inches; the French buſhel, as uſed in Paris, contains 640 cubic inches and 71-100 of an inch.

Thus ſomething leſs than three French buſhels or what they call half a mine in Paris, is equal to an Engliſh or ſtatute buſhel.

An Engliſh quarter containing eight buſhels is equal to one French ſeptier, 8 and 1-2 buſhels.

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TABLES of Progreſſion, to reduce various French acres, and to ſhew how many feet and ſquare fathoms are contained in the ſquare rod, according to its ſurface from 18 to 22 feet.

| The Rod having feet. | The Square Rod contains | | |
|---|---|---|---|
| | Feet. | Fathoms & Feet. | |
| 18 | 324 | 9 | 0 |
| 19 | 361 | 10 | 1 |
| 20 | 400 | 11 | 4 |
| 21 | 441 | 12 | 9 |
| 22 | 484 | 13 | 16 |

How many feet and ſquare fathoms are contained in a ſquare acre, according to its ſurface from 18 to 22 feet.

| The Rod having feet. | The Square Acre contains | | |
|---|---|---|---|
| | Feet. | Fathoms & Feet. | |
| 18 | 32400 | 900 | 0 |
| 19 | 36100 | 1002 | 28 |
| 20 | 40000 | 1111 | 4 |
| 21 | 44100 | 1225 | 0 |
| 22 | 48400 | 1344 | 16 |

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RESULTS OF METEOROLOGICAL OBSERVATIONS made on the THERMOMETER, BAROMETER and HYGROMETER—on the former inſtrument for one year, beginning on November 1, 1793, and ending on the 31ſt of October, 1794. On the Barometer from the 8th of May, 1794, and ending 31ſt October following:—And on the Hygrometer commencing with the Barometer, and ending 30th Auguſt following. It is intended that theſe obſervations ſhall be continued regularly on the three inſtruments, and publiſhed from time to time.

| | D. hd. |
|---|---|
| Mean temperature of the Thermometer for one year at 8 A. M. | 51—51: |
| Do. do. of the do. — do. at 1 P. M. | 57—6 |
| Do. do. of the do. — do. at 6 P. M. | 56—28 |
| Do. do. of the whole year — — | 50—34 |
| The warmeſt days were the 2d and 4th of Auguſt — | 89—0 |
| The coldeſt do. were the 27th of Dec. and 4th of March — | 10—50 |
| The greateſt annual range between the 4th of March and 2d Aug. | 78—0 |
| The greateſt monthly range between the 4th and 24th March | 53—50: |

| | D. hd. |
|---|---|
| The greateſt range in 24 hours was the 12th March — | 22—0 |
| 61 Days the Thermometer was at and below freezing, at 8 A. M. | |
| 14 Days there was Snow. | |
| 108 Days there was Rain. | |
| 144 Days it was clear at eight, one and ſix o'clock. | |
| 85 Days it was cloudy at eight, one and ſix do. | |
| 207 Days the Wind was to the Weſtward of the North and South points. | |
| Ten months the Weſterly were the prevailing winds. | |
| Two months, viz. March and May, Eaſterly were the prevailing winds. | |

| | Number of days that it ſnowed. | Number of Days that it rained. | Number of Days that it was clear three times a day. | Number of Days that it was cloudy three times a day. | Coldeſt Days. | Warmeſt Days. | Number of days the wind to the weſt of N. and S. | Number of Days at and below froſt at 8 A. M. | Greateſt monthly range. | Greateſt range in twenty-four hours. | Mean temperature of the whole month. | *Reſults on the Barometer.* Day of the mo. height of merc. in inches & tooths. | Day of the mo. height of merc. in inches & tooths. | Greateſt monthly range—difference in inches and tooths. | *Reſults on the Hygrometer.* Day of the mo. degrees and hundredths— | Day of the mo. degrees and hundredths— | Greateſt monthly range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1793 | | | | | | | | | | | d. hdth. | | | | | | |
| November | 1 | 12 | 7 | 9 | 19th 31—1 | 4th 64 | 19 | 1 d. | 33 d. | 13 d. | 40—44 | | | | 31 th 64—50 | 17 th 35—50 | 29—00 |
| December | 2 | 5 | 12 | 8 | 27th 10—50 | 18th 46 | 26 | 14 | 35 | 15 | 30—32 | | | | 1 th 65—25 | 22 d. 58—00 | 27 d. 25 |
| 1794 | | | | | | | | | | | | | | | | | |
| January | 4 | 6 | 10 | 6 | 25th 11—50 | 10th 54 | 18 | 21 | 43 | 15—50 | 30—2 | | | | 17 th 58—00 | 30 th 40—25 | 17—15 |
| February | 4 | 5 | 11 | 9 | 6th & 17th 11 | 20th 47—50 | 23 | 21 | 36—50 | 18—50 | 40—14 | | | | 10 th 59—00 | 13 th 40—00 | 19—00 |
| March | 3 | 8 | 14 | 7 | 4th 10—50 | 24th 64 | | | 53—50 | 22 | 40—29 | | | | | | |
| April | | 8 | 13 | 6 | 10th 36 | 30th 69—50 | 18 | 17 | 33—50 | 15 | 50—17 | highest | loweſt | | | | |
| May | | 12 | 10 | 11 | 18th 47 | 14th 86 | | 18 | 39 | 15 | 60—37 | 23 d. 30—70 | 29 th 29—60 | 1—10 | | | |
| June | | 10 | 11 | 8 | 27th 59—50 | 18 & 19th 80 | 21 | | 20—50 | 14 | 60—98 | 25 th 30—10 | 20 th 29—50 | 00—60 | | | |
| July | | 7 | 14 | 6 | 5th 65 | 19th 86 | 21 | | 21 | 11 | 70—20 | 2 d. 30—20 | 12 th 29—55 | 00—65 | | | |
| Auguſt | | 7 | 15 | 6 | 29th 66 | 2d & 4th 89 | 17 | | 23 | 14 | 70—30 | 30 th 30—25 | 5 th 29—60 | 00—65 | | | |
| September | | 9 | 16 | 3 | 24th 51 | 20th 84 | 21 | | 33 | 12—50 | 60—90 | 10 th 30—27 | 17 th 29—55 | 00—72 | | | |
| October | | 7 | 11 | 6 | 24th 40 | 12th 68 | 23 | | 28 | 19 | 50—11 | 6 th 30—31 | 27 th 29—48 | 00—83 | | | |

IT is worthy of remark that May, which is generally conſidered the moſt pleaſant month, will be found on inſpection to have been one of the moſt unpleaſant and diſagreeable of the laſt year:—It will be found alſo that the changes of the Barometer are not very great in this climate—for in the laſt ſix months, not an inch variation has taken place: The month of March is remarkable; it produced one of the coldeſt days—the greateſt monthly range—and the greateſt range in 24 hours, in the year. Theſe remarks and obſervations are intended to give us an idea of the changes and temperature of the climate we live in; and if in theſe reſpects it ſhould be found by even one of my fellow-men to be any ways pleaſing or uſeful—the authors higheſt gratification will be afforded.

# A TABLE OF METEOROLOGICAL PHENOMENA,

OBSERVED IN THE CUPOLA OF THE EXCHANGE, AT THE LOWER PART OF BROAD-STREET, IN THE CITY OF NEW-YORK, BY *Mr. GARDINER BAKER, KEEPER OF THE MUSEUM.*

THE THERMOMETER IS MADE BY NAIRNE AND BLUNT, AND GRADUATED ACCORDING TO FAHRENHEIT'S SCALE: THE HYGROMETER IS UPON THE PLAN OF MR. DE LUC, AND MADE BY THE SAME ARTISTS:—AND BOTH CORRESPOND WITH INSTRUMENTS OF THE SAME KIND IN THE POSSESSION OF THE PROFESSOR OF CHEMISTRY AND AGRICULTURE, IN COLUMBIA COLLEGE.

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